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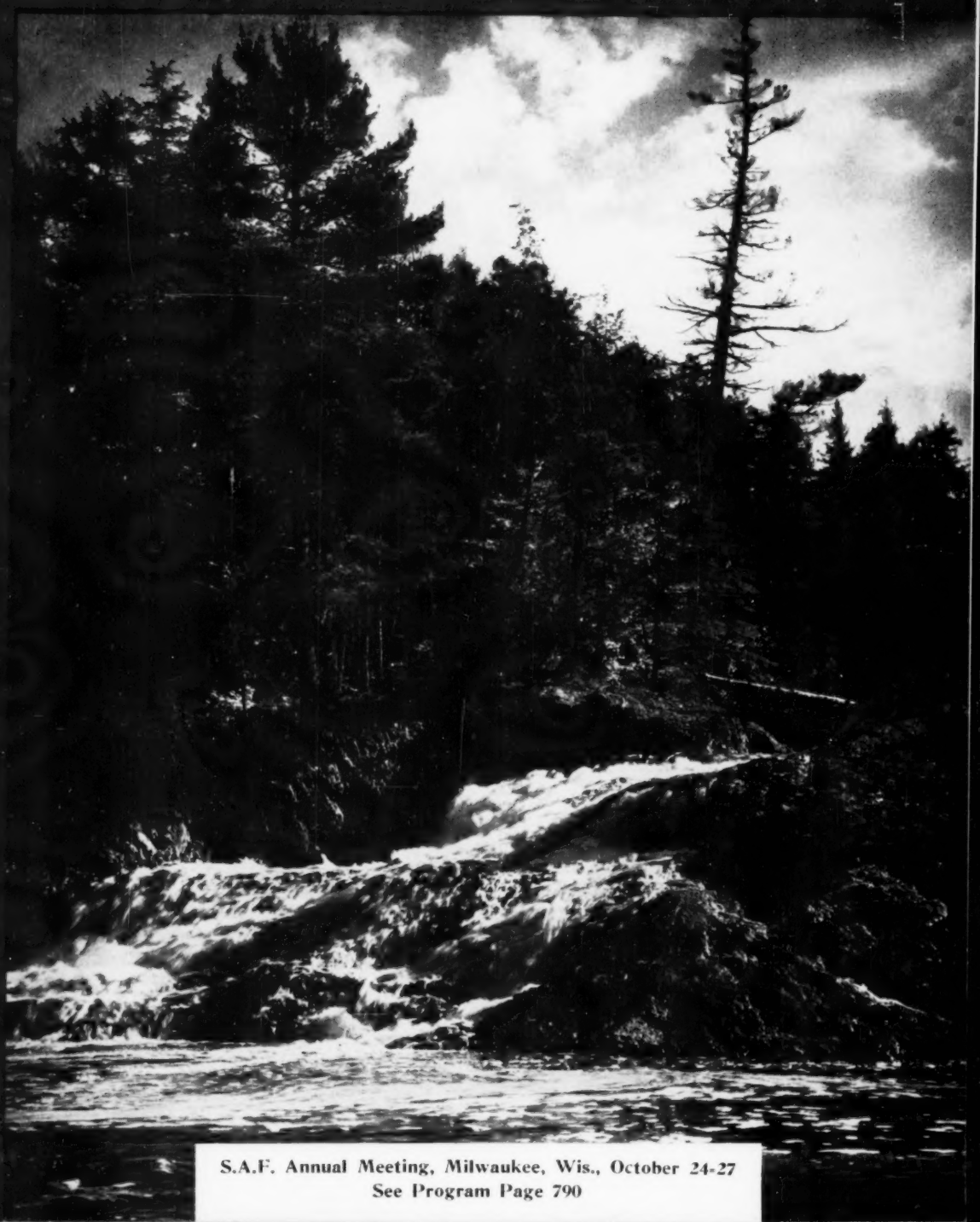

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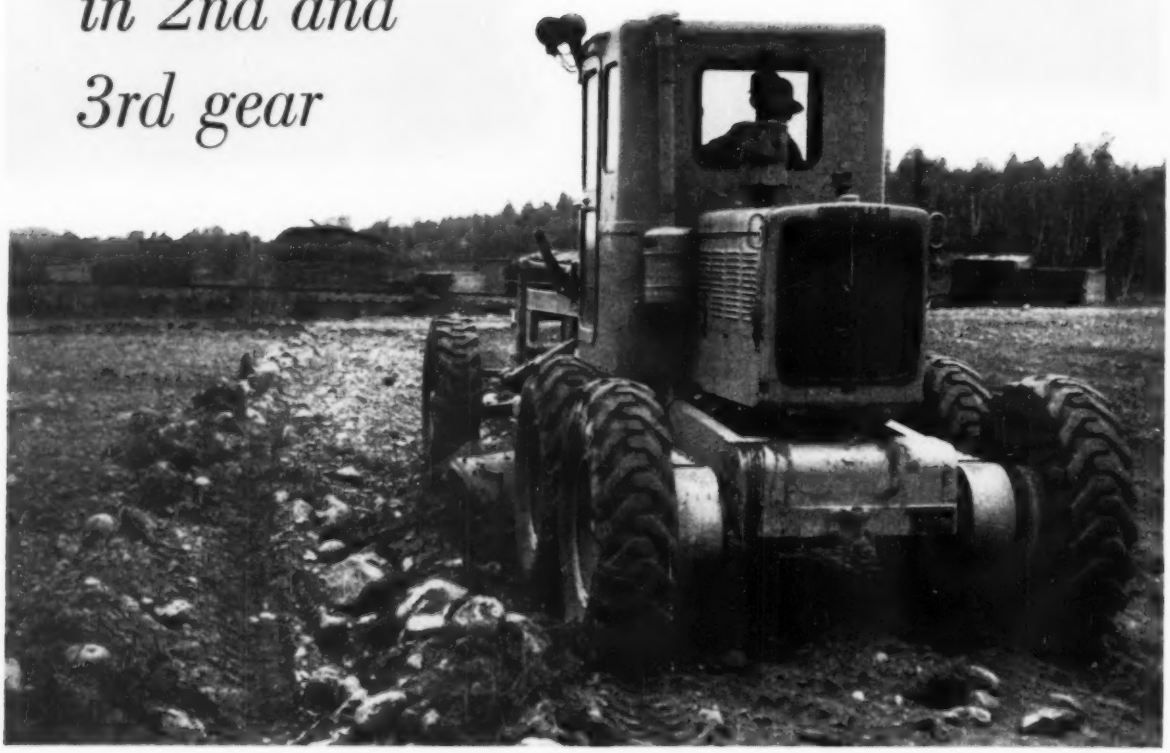

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Journal of Forestry

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Administrative Management in Forestry[1]

Earl W. Loveridge
Assistant chief, U. S. Forest Service, Washington, D. C.

SEVENTY-FIVE PERCENT of the members of the Society of American Foresters are engaged most of their working hours in some aspects of administrative management. That percentage—the best estimate I have been able to obtain—is no doubt high for forest schools and research units, and low for the industry-forester group, but it seems to be about right for both federal and state forestry organizations responsible for on-the-ground action. Whether that percentage is precisely correct or not, there is little doubt but that foresters participate widely in administrative management activities and consequently, it seems particularly appropriate for this subject to be given consideration by them. As brought out later, other professional organizations are just beginning to give increased attention to this subject. It is gratifying, therefore, that ours is young enough and virile enough to keep abreast —even ahead—of most professional groups in this important field.

Let me introduce this subject by referring to a few definitions. "Administrative management," as defined by a leading authority (*9*) is: "the direction of an organization for the purpose of carrying out specified objectives in such a way that its policies, methods, and total operations realize this objective effectively and economically in performance, and harmoniously and satisfactorily for the persons involved."

More in the language of foresters is the statement in Fernow's textbook, *Economics of Forestry*, wherein he pointed out that "as in every productive industry so in the forestry industry we can distinguish two separate yet necessarily always e l o s e l y interdependent branches, namely, the technical art which concerns itself with the production of the material, and the business art which concerns itself with the orderly, organized conduct of the industry of production. A forester then is not, as the American public has been prone to apply the word . . . a botanist; nor . . . a dendrologist; nor . . . an arboriculturist; nor . . . a lumberman, nor . . . even . . . a silviculturist; but in the fullest sense of the term, a forester is a technically educated man who . . . combines . . . knowledge which enables him to *manage* a forest property so as to produce certain conditions resulting in the highest attainable revenue from the soil by woodcrops."

I do not agree with that "fullest sense of the term" expression, but Fernow did make a noteworthy point in that definition—that foresters do, perhaps, tend to focus too exclusively on biological aspects, and to give inadequate attention to the administrative management side of forestry activities and responsibilities. However, foresters are not the only ones who have been criticized in much the same way.

For example, in the course of a trip in Latin American countries last year, I found that many scientifically fine biological reports prepared for them are just gathering dust in what they called their "Archivos." Needed most urgently now, their foresters say, is not more of those reports so much as knowledge of how to put the technical reports they already have actually into effect.

Similar statements have been made by foreigners in this country on training missions. Large numbers of them are constantly visiting our land-use and water-management projects. They see under way dams and vast irrigation works, and extensive conservation programs of other types. A Reclamation Service officer told me recently that almost always the v i s i t o r s (from underdeveloped countries) ask, "How do you do so much, so fast, and at such relatively low costs?" The answer they are seeking, he said, is given them in group courses in administrative management.

Operations Research

Another relatively recent development in this connection is the Operations Research movement. A magazine article (*10*) of not long ago, entitled "The Mysterious Mission of ORO" described it as "one of the brainiest devices the Army ever thought of." The committee of the National Research Council which has been sponsoring "Opsearch," as it is often called, is made up of such nationally known scientists as Charles Kittle of Bell Telephone Laboratories; Philip M. Morse, Dept. of Physics, M.I.T.; Walter Bartky, Physical Sciences Division, U. of Chicago; Frederick F. Stephan, Dept. of Economics and Social Institutions, Princeton U.; Warren Weaver, Rockefeller Foundation; Sir Charles Goodeve, The British Iron and Steel Research Assn., and others (*1*).

The Operations Research projects are commonly carried on by

[1] Presented at the Annual Meeting, Society of American Foresters, Colorado Springs, Colo., September 1953.

teams of scientists. It might be said facetiously that no one qualifies for these teams unless he has a Van Dyke beard and a doctor's degree. About a year ago they formed their own professional Operations Research Society of America.

There are several reasons for mentioning this group to professional foresters. First, is the fact that many of their study projects are similar to the administrative management problems with which resource managers are commonly faced. Second, to quote from one of their publications: "The techniques and methodology of operations research . . . have a great deal in common with the techniques and methodology of . . . management . . ." (*5*). Finally, if that just-mentioned calibre of Van Dyke'd personnel recognizes administrative management problems as meriting their most earnest attention, foresters may well continue to do likewise. We will be in good company.

Scientific Management

The foregoing has mainly been background material and generalizations. To cover this subject at all adequately, personnel matters including recruitment, education, training, and professional qualifications should be discussed. They are, needless to say, highly important. Fortunately, they have been the subject of many discussions and publications by foresters. Little, however, has been published about the "scientific management" features of administrative management as they can be applied to forest organization and administration. Consequently, the remainder of this paper is limited mainly to that important subject.

In brief, scientific management calls for applying to the problem of administration the same general principles of the "scientific method" that have been followed by most technical researchers since the days of Sir Francis Bacon. In contrast to instinctive, emotional, or rule-of-thumb operations, the method is essentially analytical and rational. It results in management by design—rather than by accident.

As pointed out by Dr. Harlow S. Person (*8*), an outstanding authority on management, in his talk at the Eighth International Management Congress in Stockholm not long ago, "The techniques (of scientific management, as originated and developed first by Frederick W. Taylor) consist of two major parts, each much less fruitful without the other; first, discovery through every resource of scientific method of the natural laws . . . physical and psychological . . . that govern a particular management situation; and second, construction of a frame of managerial conduct, or methodology, that observes these laws. . . ."

Or, as defined more specifically by the late Justice Brandeis of the Supreme Court of the United States: "Scientific management . . . replaces empiricism by predetermination of results; the haphazard . . . by the . . . application of scientific laws. Each process of work is analyzed into its ultimate units. Each smallest step of the process is compared with an ideal standard of performance, and allowance being made for practical conditions, an obtainable commercial standard is set for each unit of work, and for the whole work reassembled in entirety."

Application on the National Forests

The problem facing us on the national forests is well known to most foresters. It is described in detail in two companion articles (*4, 6*) in the Department of Agriculture yearbook for 1949. Those articles bring out that the national forests involve a very great volume, and variety, of forestry and related activities, widely dispersed all over this country. Decentralization, delegation of authority, good personnel management and controls are indispensable. However, decentralization and the other factors just mentioned have not, alone, assured effective management.

It was found at the time our more intensive management studies were started (about 1926) that, too often, highly important activities were being slighted, and research findings were not being used. Also, some rangers and supervisors, for example, were overworking to the point of exhaustion, while some in other locations were relatively unoccupied much of the time.

The principal reason for these very serious variations in the workload of employees in comparable grades was that the amount of funds allotted for, and consequently the amount of work expected of, each of these foresters was based on "general judgment," on rule-of-thumb methods. As a result, the average area of the ranger districts, for example, in one national forest region was 162,000 acres. In an adjacent region with similar activities the average was more than 60 percent larger.

Area alone is no sure indication of volume of work. However, careful analyses showed that in some places there were correspondingly great differences in the workload as well. To one unacquainted with the variety and complexity of the jobs involved, this may seem to have been just ordinary poor judgment, but serious and unjustified variations in workload per employee are a very common occurrence in industry as well as in government. Instead of the previous rule-of-thumb methods, it was evident that there was need for a more scientific basis for (a) the maning of administrative units, (b) the organization set-ups, (c) the allocation of funds, and (d) the all-important controls, both administrative and financial.

To meet these needs called for improvement in organization, and in administrative management. Both are dependent in very large part on an accurate measurement of workloads. This was done by adapting and utilizing a basic feature of scientific management—workload analyses (*7, 3*). This method parallels in considerable part the use of scientific management in American industry.

Among the several overall aims of workload analysis are two principal ones:

1. To get the work done with as high standards of quality, quantity, and economy as practicable.

2. To do so with unfailing regard for the men who are to perform the work.

Note that last point particularly. The spiritual elements involved in working relations of all sorts are of absolutely controlling consideration.

Included among the corollary aims is a meeting of minds between the supervisor and the worker. Also of major importance is the determination, for each point reviewed during the course of the analysis, of any needs for specialized training and development for each employee involved.

Steps in Workload Analysis

The workload analysis method as applied to studying, organizing, and administering national forest work consists of five main steps. You will note they conform in principle to the previously quoted definition of scientific management by Justice Brandeis.

As a first step, the objective sought in each field is clearly established. Many of the objectives are already available in resource-management plans, manuals, handbooks, and work programs. For example, the fire control objective for a specific area may be to hold the area burned to one-tenth of one percent at a maximum specified average cost. All subsequent steps in the analysis are aimed toward reaching this specific goal. Proper and sharp definition of objectives provides a stimulating incentive to distinguished effort. It also serves as a helpful shield against diverting proposals.

The second step is to break each activity down into the component jobs that must be performed to attain the objective. In fire control, to continue our example, that means of course the many individual jobs involved in each phase of prevention, presuppression, and suppression.

The third step is to determine and establish, through the use of scientific-management methods, standards for each of the component jobs; that is, the standards of quality, quantity, frequency, and the methods and other practices needed to do the work as it should be done. For example, each fire control crew will be given three days of pre-season training; each lookout will be inspected monthly, and so on, based on written instructions for training, inspection, and each other standard established. A very important caution to note here is, "Never accept, without a challenging review, that past practice is the practice that should be followed in the future." That is a vital feature of workload analysis and planning.

That is a job analysis up to this stage. To develop it into a job-load analysis, the fourth step is taken. That calls for determining the unit-time requirements for doing each job in accordance with the standards established. The making of time studies is, of course, very important. However, we have not found it necessary in studies of forest organization and administration, to try to be as precise as do industrial engineers. Great improvements can be made and satisfactory standards established without the irritations that result from trying to be precise. On the other hand, casual or careless time estimates will result in a quite useless analysis. Another major caution is offered here. That is to "go see." That is, actually see the job being done as it should be done, and to note the time required to do it in that manner. A discussion will not take the place of "go see."

The fifth step calls for grouping the separate jobs into the months in which they can be done, as controlled by the work requirements, the climatic conditions, available time, and other factors. A main purpose of this step is to redistribute peak loads to the less busy periods of the year, to the extent practicable, and thus strive for a well-balanced yearlong program of work. Another important purpose served by this step is to provide a plan of work for each month. These plans, although flexible, are of great value to the employee involved in performing his work in line with his supervisor's desires—as expressed in the workload analysis. They also serve as an excellent administrative "control."

The total of the time requirements shows, of course, the total job-load weight, in man-hours, of the ranger district, forest, or special project that is being studied. And since man-hours can be converted readily into dollar terms, this step shows the amount of funds needed to accomplish the work in the volume and up to the standards set forth in the workload analysis. In other words, it provides a sound basis for budget presentations and for the allocation of funds to each administrative unit or work project.

I wish to acknowledge here the great amount of support which has been given to the development and application of scientific management as represented by workload analysis and planning in the Forest Service. All authorities point out that programs of this sort get nowhere without the support and encouragement of the chief administrator. We were very definitely fortunate in that respect when Colonel Greeley was chief of the Forest Service. So a top acknowledgment goes to him. Other chiefs of the Service since that time and their assistants have unfailingly done likewise. Roy Headley, his assistant chief for Operation, and Peter Keplinger, staff advisor on Administrative Management, provided many ideas and gave much impetus to the study and organization of national forest activities in this manner. Pitchlyn in California, Jim Scott in New England, and many, many others made major contributions.

A special advantage of the workload analysis method is that it enlists the cooperation of the entire organization. To that end the analyst, in the course of each study, seeks the points of view of the local ranger, of his supervisor,

and of the functional experts in each field of work. Such joint consideration establishes, clarifies, and defines in specific form both the major and minor duties of the employee. It results in widespread education and training on the part of all the participants. It promotes a common understanding of the work between subordinate and supervisor. It resolves misunderstandings which, otherwise, are almost certain to develop from the long-distance supervision inherent in national forest work. This result has become recognized as one of the main benefits of a job-load analysis program. Nevertheless, the analyst recognizes that he must not substitute a discussion for an investigation; that five or six opinions are not necessarily better than one—all may be quite worthless. Instead, *facts* based on investigation and experiment, including analysis, measurement, and comparison, provide the only sound basis on which the job-load determinations can be made.

Other Uses of Job-Load Analyses

With the job-load weight and number of man-hours of work required thus arrived at, the number and class of employees needed is readily determined.

It also provides a factual basis for determining the size of administrative units.

And, because number of hours may be readily converted to the number of dollars, the job-load analysis provides the primary base for two essentials of budget and financial management. First, it furnishes the soundest foundation possible for estimates submitted to Congress as to the amount of appropriations needed for salaries of rangers and their assistants, special timber-sale projects, and each of the other activities on the national forests.

After the appropriations are made, the calculated workload is the fairest basis for allocation of funds, by activities, to the regions, the national forests, ranger districts, and special projects.

Job-Load Analysis as a Basis for Work Planning

The five steps in work-load analysis outlined determine the total time that is required to handle each job so as to attain the specified objective. The next step is to convert this analysis into a plan of action. A start on this is made, as previously stated, by assigning each job, or a specified part of each job, to each of the months during which it should be performed. The resulting list of jobs in each month is then assembled into an integrated plan of work.

On a ranger district, for example, the list of jobs for a month will include a great variety of work such as timber sales, inspection of fire guards, range management, and special-use administration, scattered probably over a quarter of a million acres. Travel time alone, on horseback and otherwise, may require as much as 35 percent or more of the total time devoted to all the duties on the district. Obviously, therefore, unless the work is carefully planned, travel may be unproductive and reach unreasonably high totals, so as to shorten appreciably the time available for the actual fulfillment of duties.

Controls

The workload analysis and work plans with their clearly defined objectives and standards, together with the allotment records based upon them, provide the soundest possible basis for administrative and financial controls. Together with an adequate cost-accounting system, these controls are obtained through periodic reports and spot-check inspections. In this manner expenditures of time and money as contemplated by Congress are assured.

Conclusion

My statement has been entirely too brief to give much of a picture of the use of scientific management in the work of a forest administrator or other professional forester. Many factors are involved that have not been mentioned. We have recognized clearly, for example, that persons in these positions have to deal with many perplexing imponderables, variables and unforeseens. Therefore, the standards to which these employees must work cannot be as precise as are those to which production groups must work. Nevertheless, in our experience over the past 20 years, the results have been an outstanding contribution to obtaining improved forestry practices. At the same time they have provided a fairer and happier distribution of the workload among the foresters responsible for handling it.

The foregoing, although related to the use of scientific administrative management in all fields, has been pointed mainly at its use in government operations. Its greatest use has, of course, been in industrial fields. "There is scarcely an enterprise or stability or consequence, of whatever size, that has not been touched by (the influence of scientific management) at one point or another. The cumulative effect played an outstanding part in recent amazing war production" (*2*).

Bill Duerr developed this point more specifically before a meeting of the New England Section as reported in the *Monthly Review* of the Federal Reserve Bank of Boston, for May, (1953) as follows: "The National Bureau of Economic Research reported that in . . . 40 years all industries combined showed a 113% increase in physical output per man-year of labor. . . . In the paper and allied industries, the average worker did even better than this. But in the rest of the timber-based industries . . . where the great bulk of timber is used . . . output per man-year barely increased at all. The tremendous gains in output by labor in most American manufacturing industries were made not by working harder or longer. Rather, they came with the help of better materials, equipment, methods and skills—that is, technological progress, a continuing industrial evolution. It is clear that in most of

the forest economy there has been no such evolution."

That is a good note on which to close this review. The challenge implied in that last sentence is directed at industrial as well as government foresters. It will be met, I am sure, by the increasing application of the basic principles of scientific management to administration, since administration is responsible for technological progress and is the sparkplug on which it depends.

Administrative management, as has been repeated frequently throughout this paper, must include high-level personnel management, with its thoughtful attention, at all times, to human relationships.

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Status of College Instruction in Forest Influences and Watershed Management

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ONE OF THE most rapidly growing facets of forestry and conservation in the past decade has been the field of forest influences and watershed management. The influence of forests on climate and water was a subject of considerable interest and speculation even during the early years of settlement of this country. Much of our pioneer legislation in forestry and conservation stemmed from beliefs which were then prevalent concerning such influences. Lull[2] has very aptly traced the history of the forest influences concept and its effect upon the conservation movement.

Like our forest and range resources, our water resource was until recently thought to be inexhaustible. In some areas it has been overexploited and serious shortages or pollution problems exist. Research, for the most part within the past 25 years, has shown that water, like our other natural resources is subject to management. Increasing population pressures and newly found uses for water have focused considerable attention within the past decade on such management. Since foresters have been responsible for much of our watershed land area, flood and erosion control, municipal water supply and industrial interests turned to the forester, the conservationist and the engineer for assistance in watershed and water management. In response to this additional assignment, the forestry schools of the country in increasing numbers have added formal instruction in forest influences, watershed management and closely related subjects to broaden the training of the forestry student.

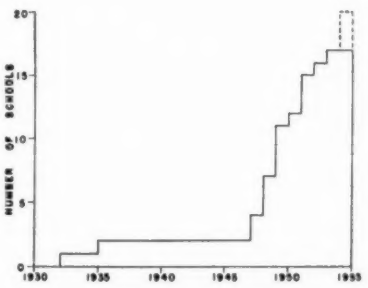

FIG. 1.—Increase in number of accredited forestry schools offering formal course work in forest influences and watershed management.

To determine the response of the Nation's forestry schools to the growing interest in this field, a poll of the 25 accredited and 11 non-accredited forestry schools was conducted during the winter of 1952-1953. The results of this survey indicate that the schools in increasings numbers are attempting to provide professional instruction in forest influences and watershed management.

Of the 25 accredited colleges and universities in the United States offering instruction in forestry, 17 now offer one or more formal courses in forest influences and closely related subjects. None, however, of the 11 non-accredited institutions offer such courses. Several such schools noted the desirability of adding instruction in this field but did not anticipate action in the near future. Three of the 11 schools indicated that some of the subject matter was covered in other forestry courses given at their schools. Figure 1 traces the increase in the number of accredited schools offering formal courses in this field from 1930-1953 and projected to 1955. Table 1 summarizes the courses offered by our accredited forestry schools.

The first formal course in forest influences was offered by Dr. Jo-

[1]Secretary, Watershed Management Division, Society of American Foresters.
[2]Lull, Howard W. Forest influences: growth of a concept. Jour. Forestry 47(9): 700-705. 1949.

TABLE 1.—ANALYSIS OF FORMAL TRAINING OFFERED IN FOREST INFLUENCES AND RELATED SUBJECTS AT THE ACCREDITED INSTITUTIONS IN THE UNITED STATES OFFERING INSTRUCTION IN FORESTRY

School or University	Course title(s)	Year course was initiated	Number of hours per week lect.	lab.	Required or elective course	Graduate or Undergraduate Credit	Major Emphasis	New or additional courses contemplated	Research facilities available	Covered partially in other courses
Alabama Polytech. Inst.	Forest Influences	1952	4	3	Required	Graduate	Ecology		Yes	
Univ. of California	Forest Influences	1932	2	3	Elective	Both	Hydrology		Yes	
	Forest Influences (Sem.)	1933	2	0	Elective	Graduate	Hydrology			
Colorado A & M College	Prin. of Watershed Management	1947	2	3	Elective	Both	Ecology		Yes	
	Watershed Analysis	1948	3	0	Elective	Graduate	Land Mgt.			Yes
Duke University										
Univ. of Florida										Yes
Univ. of Georgia	Forest Influences	1951	3	0	Elective	Undergraduate	Land Mgt.		Yes	Yes
Iowa State College	Forest Influences	1949	3	0	Elective	Both	All		Yes	
Louisiana State Univ.										Yes
Univ. of Maine	Forest Influences	1951	2	0	Elective	Undergraduate	Ecology			
Univ. of Massachusetts	Forest Management of Watersheds	1948	3	2	Elective	Both	Ecol.-Hydr.		Yes	
Michigan State College	Forest Hydrology	1951	2	3	Elective	Graduate	Hydrology		Yes	
	Forest Influences	1952	2	3	Elective	Both	Ecology			
Univ. of Michigan								Yes		
Univ. of Minnesota	Forest Influences	1953	3	0	Elective	Both	Ecology		Limited	
Univ. of Missouri	Forest Influences	1947	2	0	Elective	Graduate	Hydrology		Yes	
Montana State Univ.	Watershed Management	1949	3	4	Elective	Both	All			
State Univ. of New York								Yes	Yes	
North Carolina St. Coll.								Yes		
Oregon State College	Forest Influences	1949	3	0	Elective	Both	Ecology		Yes	
	Forest Management	1953	3	0	Required	Both	Land Mgt.			
Pennsylvania State Coll.									Yes	
Purdue University	Forest Influences	1948	3	0	Elective	Both	Ecology		Yes	
Utah State Agr. Coll.	Watershed Management	1935	3	1	Required	Undergraduate	Hydrol.-Land. Mgt.		Yes	
	Vegetation Influences	1947	2	0	Elective	Graduate	Ecology			
Univ. of Washington	Forest Influences	1950	3	3	Elective	Graduate	Land Mgt.		Yes	
West Virginia Univ.	Climatology & Hydrology	1948	3	0	Elective	Undergraduate	Hydrology		Limited	
Yale University	Forest Meteorology	1949	2	3	Elective	Graduate	Ecol.-Climate		Yes	Yes

seph Kittredge at the University of California in 1932. In 1935 Utah State Agricultural College initiated a similar course. Following a lull of 12 years, a sharp increase is noted during the period from 1947 to 1953 inclusive, when 15 more institutions added formal courses in the field. In all, 17 schools will offer such courses in 1953. Three additional schools indicated that attempts were being made to offer similar courses in the near future.

All of the seven accredited western schools offer formal courses in forest influences. Of the seven accredited institutions in southeastern and southern United States only West Virginia University and Alabama Polytechnic Institute offer work in this field. Of the eleven remaining accredited schools located in central and northeastern United States, eight offer such training.

Five of the 17 schools offering such training list two formal courses. In addition to the formal courses listed in Table 1, six schools indicated that influences training was available in the form of special problems courses or informal seminars. For this analysis however, only formal courses were considered. Of the total of 22 courses offered, 10 included laboratory work. In three schools the forest influences courses were required of forestry majors. At two other schools, the course was required of majors in fisheries and wildlife management. Eight of the 22 courses offered carried graduate credit only, four were for undergraduates and 10 could be taken at either level.

The most popular course title was "forest influences" with 12 courses so labeled. Five courses were titled "watershed management," "forest management for watersheds" or "watershed analysis." Other course titles included "vegetation influences," "forest hydrology," "forest meteorology" and "climatology and hydrology." The number of students enrolled in the courses varied from 2 to 40. The average number of students electing the courses, graduate and undergraduate levels, was 10. The three most popular textbooks listed

in order of preference were *Forest Influences* by Kittredge, *Hydrology* by Wisler and Brater, and *The Climate of the Air Near the Ground* by Geiger.

The survey further indicated that in eight of the 22 courses, major emphasis was placed on the study of ecologic relationships. In six courses more emphasis was placed on hydrology. In the remaining courses, the subject was approached primarily from a land management standpoint or a combination of ecologic, hydrologic, climatologic and land management views. Although not requested in the questionnaire, five of the institutions indicated that the subject of forest influences and watershed management was covered in other forestry courses offered, primarily in ecology or silvics, in forest soils and in forest management. This is undoubtedly true in many of the other institutions also. Several schools stated that new or additional work in this field was highly desirable but that staff and curriculum limitations prohibited this, at least for the immediate future. Several schools also indicated that their students had the opportunity to elect courses in hydrology offered in civil engineering and geology departments.

Of the 25 accredited forestry schools, 17 indicated that facilities for research in forest influences and watershed management were available. Several others indicated that facilities were available for special ecological and soil hydrology studies. Michigan State College offers a research assistantship in the field of forest hydrology in cooperation with the Michigan Agricultural Experiment Station. Michigan State also reported that several graduate student research programs had been arranged in cooperation with the Coweeta Hydrologic Laboratory, Southeastern Forest Experiment Station, U. S. Forest Service.

It is probable that in the future many schools will develop separate curricula in this phase of forestry. The report from Colorado A & M College indicated that a Master of Science or a Master of Forestry degree, both with major in watershed management are now offered there. Although not yet listed in their catalog, Colorado A & M College has also planned and set up an undergraduate curriculum in watershed management. North Carolina State College has requested legislative action to initiate a graduate program in this field.

It is apparent that the Nation's accredited forestry schools are keeping pace with the increased interest in forest influences and the management of our water resource. Within a period of a little over six years, 19 new courses covering this field have been introduced into 15 of our accredited forestry schools. Based on anticipated new courses, by 1955 probably more than 25 separate formal college courses will be offered in at least 20 of our 25 presently accredited forestry schools.

Visitors Welcome at Central States Experiment Station and Research Centers

Through an oversight, which the JOURNAL regrets, the Central States Forest Experiment Station was inadvertently omitted from the guide map to locations in the north central states of interest to foresters.

This map and accompanying descriptive list were published in the August issue (pages 599-602) for the information of foresters attending the Society meeting in Milwaukee, October 25-27.

The Central States Forest Experiment Station is located in the Old Federal Building, Columbus 15, Ohio, and will welcome visitors enroute to or from the meeting.

Visitors are welcome also at the research centers of the station, located in Athens at Ohio University; at Iowa State College, Ames; at the University of Missouri, Columbia; and at Carbondale, Ill., where the station is cooperating with Southern Illinois University in forest utilization studies.

Effect of Animal Damage on a Young Coniferous Plantation in Southwest Washington

George R. Staebler, Paul Lauterbach, and A. W. Moore

U. S. Forest Service, Weyerhaeuser Timber Company, and U. S. Fish and Wildlife Service, respectively.

ANIMAL DAMAGE is one hazard besetting young coniferous plantations. Plantations are usually established in cut- and burned-over areas where ecological conditions have been so radically altered that animal populations are often high. The sequence in the Pacific Northwest is a familiar one: removal of the forest, often followed by slash or accidental fire, results in a great increase in the vegetation preferred by many animals, and populations are quick to build up. Frequently, deer, rabbits, and rodents, particularly mountain beavers, become so plentiful that the animals deplete their new food source and are forced to eat the less palatable plant species, including forest seedlings that may have been planted. This threat to plantation success is often a serious one.

The Puget Sound Research Center, a branch of the Pacific Northwest Forest and Range Experiment Station; Weyerhaeuser Timber Company; U. S. Fish and Wildlife Service; and Western Washington Experiment Station of the State College of Washington have cooperated in a study of this problem. The experiment, intended to explore the nature of the problem and the type of study required, was begun in 1947. It is designed to trace the effects of deer, rabbits, mountain beavers, and cattle on a young plantation of Douglas-fir, Port-Orford-cedar, and western hemlock established in an area of high animal populations on the Clemons Tree Farm in southwestern Washington.

Animals Responsible for Damage

The deer inhabiting the area is the black-tailed deer (*Odocoileus hemionus columbianus*), common to western Washington. This deer is overnumerous in the area (population estimated at 30 or 40 per square mile[1]) and deer have continually utilized many of the browse plants so that a browse line is readily apparent.

The mountain beaver (*Aplodontia rufa rufa*) is a burrowing rodent of robust build commonly found west of the Cascade range. Its food consists of almost any vegetation that grows in its foraging area, including bracken fern. The animal frequently girdles tree roots below ground, killing the tree or causing it to be blown over. It also clips twigs or branches up to 5/8 inch in diameter; sometimes it climbs small trees, prunes off all branches and cuts the leader. Mountain beavers were numerous on the area chosen for the experiment and were presumed to have been at least partly responsible for earlier plantation failures in the vicinity.

The "rabbit" of western Washington is, strictly speaking, a hare, *Lepus americanus washingtonii*. When abundant, the animals are destructive to newly planted seedlings, clipping them off often just above the ground. Rabbits follow a population cycle and although at times practically none are present they may, as this experiment has shown, increase enormously in a short time.

Domestic cattle frequented the area from ranches at lower elevations surrounding the experimental area. Undoubtedly, cattle do damage seedlings and plantations in certain circumstances, but during the course of this experiment so few of them were on the area that they were not important.

Other animals, notably grouse (which eat tree buds and needles) and mice, do at times damage plantations, and some injury by these animals was noted during the experiment. Ants, also, are at times destructive; they girdle stems just above the root collar and the girdled portion becomes infested with aphids, which the ants "culture." Damage by these animals was not followed in this experiment.

[1]Population estimates were made by the Washington State Game Commission, who also have cooperated in other phases of this study.

Description of the Experiment

The original objective of the experiment was to evaluate damage to a young coniferous plantation by deer, cattle, and mountain beaver. Almost no rabbits were on the area when the experiment was planned. Hence, no account was taken of them in designing the experiment, but rabbits immediately staged an upsurge in numbers and soon became the most damaging animal, preventing to some extent a rigorous statistical analysis of experimental results.

Three cover types were recognized on the area, which had been logged in 1927 and 1928 and slash-burned in 1930. These were: (1) grass type, characterized by stands of velvet grass (*Holcus lanatus*), with lesser amounts of bracken (*Pteridium aquilinum*), brush, and sword fern (*Polystichum munitum*); (2) low brush, mostly Oregon grape (*Odostemon aquilfolium*) less than 3 feet high; (3) bracken, characterized by heavy growth of bracken.

Scattered trees from a 1941 planting were present on the area and almost all bore some sign of animal damage in 1947. The earlier plantations had been judged a near failure, the most apparent reason being animal interference.

The experiment consists of twelve 1/4-acre plots planted in March 1947, to mixtures of 1-0 Douglas-fir and Port-Orford-cedar, and wildling western hemlock. Three additional plots 25 feet square were planted to Douglas-fir in April 1948. All planted seed-

lings were staked with cedar stakes.

Six of the large plots are in an area from which the mountain beaver have been eliminated by trapping and poisoning. The other six are in an area where this animal has been undisturbed. Of the six plots in each series, two are in each of the three cover types: grass, low brush, and bracken. Of each pair of plots, one is fenced against cattle and the other is not. The three species of trees are planted on each plot. The three small plots are fenced against rabbits, deer, and cattle, and are located on the mountain beaver-free areas, hence provide total exclosures.

It will be noted that each plot is different in the treatment received, without replication. A rough analysis of variance of results is possible, however, by using treatment interactions as experimental error.

The plots were inspected ten times after planting, between spring 1947 and spring 1951. At each inspection, survival was determined, each seedling was examined for damage, and the damage classified as ruminant (cattle or deer—damage not separable from examination of seedling), mountain beaver, or rabbit. Each year the average height of the seedlings was determined from sample measurements. Thus, s u r v i v a l, height, and damage on the different plots may be compared. The effect of cover type, tree species, mountain beaver, and cattle fences on these variables may be evaluated. In addition, changes in the small plots, from which all animals have been excluded, may be compared to results found on the larger plots.

Results of the Experiment

The four-year-old plantation is at least moderately successful, in spite of exposure to animal damage. Survival of all species except hemlock has been satisfactory, and the poor record for hemlock is not due to animals. Height growth, though reduced on damaged trees, is satisfactory. A comparatively high percentage of the surviving seedlings are deformed, most likely as a direct result of animal damage.

Damage to Seedlings

The percentage of trees deformed (Table 1) was used as one measure of the extent of damage. Abnormally bushy trees or trees with more than one leader were classed as deformed. Undoubtedly, some deformity is a natural occurrence, but in this area it is probable that the majority is a result of animal damage. In the small plots, from which all animals were excluded, 23 percent of the Douglas-fir seedlings were deformed after three years, indicating that some trees will be deformed even where no animal damage occurs. On these plots it is believed that the deformity is at least partly a result of frost damage in the nursery before the stock was lifted. The percentage of trees deformed cannot be compared directly to the damage after four years on the larger plots.

Three important results are brought out by the four years of record and observation:

1. Rabbits did the most damage to planted trees. Deer were next in importance, then cattle. Although deer and cattle damage could not always be positively segregated, in all likelihood the cattle damage was of little significance. Mountain beaver damage was negligible during the course of the experiment.

2. Rabbit damage was heaviest in the bracken and was largely responsible for the high percentage of deformity in this type (80 percent of the Douglas-fir, 67 percent of the cedar, and 34 percent of the hemlock). Most of the damage occurred in the summer months.

3. Douglas-fir throughout the experiment was the most damaged species, hemlock the least. Port-Orford-cedar suffered little damage until it was 3 years old, when deer began to browse it. Deer, apparently, have to acquire a taste for this exotic species. After 4 years, 71 percent of the surviving Douglas-fir was deformed, 46 percent of the Port-Orford-cedar, and 20 percent of the hemlock.

Unfortunately, the experiment was not designed to evaluate rabbit damage, and the presence of rabbits on all plots has more or less upset the statistical evaluation of damage caused by the other animals. Even if not planned for, however, the sudden increase in rabbits provided useful information. The trend in damage is ample evidence of the rapid increase:

Season	Percent of live trees cropped
Summer 1947	5
Winter 47-48	23
Summer 1948	15
Winter 48-49	15
Summer 1949	21
Winter 49-50	35
Winter 50-51	38

Survival apparently was not appreciably reduced in this planting, but rabbits have been known to completely wipe out a plantation. It is likely that this one survived the damage because there were few rabbits when the trees were planted. By the time the rabbits became numerous, the seedlings had one or two seasons of growth and were better able to withstand the high incidence of damage.

The difference in deformity between "mountain beaver present" and "mountain beaver absent,"

TABLE 1.—PERCENTAGE OF LIVE TREES DEFORMED, BY SOURCES OF VARIATION TESTED

Treatment	Douglas-fir	Port-Orford-cedar	Western hemlock
	Percent	*Percent*	*Percent*
All plots	71	46	20
Mountain beaver present	67	42	12
Mountain beaver absent	74	51	28
Fenced	66	41	25
Unfenced	75	51	14
Grass type	64	50	12
Low brush type	69	22	13
Bracken type	80	67	34

TABLE 2.—SURVIVAL PERCENTAGES, BY SOURCES OF VARIATION TESTED

Treatment	Douglas-fir	Port-Orford-cedar	Western hemlock
		Percent	
All plots	77	71	27
Mountain beaver present	81	75	30
Mountain beaver absent	72	68	23
Fenced	72	72	27
Unfenced	81	71	27
Grass type	77	76	25
Low brush type	84	79	28
Bracken type	69	60	27

though significant, is not a real result of the treatment, but is due to variations in rabbit damage, a factor not under experimental control. At the start of the experiment, casual observation had seemed to indicate that mountain beavers had been an important factor in the failure of earlier plantations. Certainly there was a high population of the animals, and their burrows and tunnels were everywhere on the area. Undermined trees and mountain beaver-pruned trees were easily found. Yet careful observations made on the plots planted in 1947 showed the damage done by mountain beavers was so small as to be insignificant. Never more than one or two percent, usually none, of the trees were found to have been damaged by this animal. It is probable that the earlier damage was overestimated because of its conspicuousness in the older, understocked stands.

Between fenced and unfenced plots, the differences are too small to be safely ascribed to the fences, because of high experimental error.

Survival

After four growing seasons, survival of the planted trees was: Douglas-fir, 77 percent; Port-Orford-cedar, 71 percent; Western hemlock, 27 percent (Table 2). Survival is usually quoted to indicate the degree of success of a plantation. The plantation represented in the experimental plots must be considered successful, except for hemlock, in spite of exposure to animal damage. The poor showing of hemlock is less a result of damage than of other causes, notably the use of wildling stock, much of it too large for successful planting. Also, it is a known fact that hemlock is difficult to establish in plantations.

Survival was substantially less on plots with no mountain beaver and in the bracken type. Statistical analysis shows that these differences are not a chance result. As in the analysis of deformity, survival differences between plots with and without mountain beaver are probably a result of rabbit damage and not ascribable to anything under experimental control.

The poor survival in the bracken type (69, 60, and 27 percent for the three species) is undoubtedly a real result and may be partly due to the heavy damage that rabbits inflicted on the trees in that type. Also, the bracken type, because of intense competition and deep shade, is an inhospitable site for seedlings. It is interesting to note that although Douglas-fir and Port-Orford-cedar survival is much lower in the bracken type, hemlock survival is just as good as in the other types (27 percent in the bracken, 25 and 28 percent in the grass and brush types). During the first years of the experiment hemlock, probably as a result of its tolerance, actually survived better in the bracken.

The three plots having the highest percentage of deformed Douglas-fir—from which we may infer that they suffered most from animal damage—also had the lowest survival of Douglas-fir. Hence, animal damage probably caused some mortality in addition to deforming surviving trees.

Tree Heights

After four growing seasons in the field the effect of damage on height growth was quite pronounced. Average heights of the well-formed and deformed trees were:

Species	Well-formed	Deformed
	Inches	*Inches*
Douglas-fir	30.5	20.9
Port-Orford-cedar	14.1	11.9
Western hemlock	16.1	9.2

Separation of the average heights by sources of variation tested showed that differences in heights among species and among cover types are large and unmistakable (Table 3). It is also apparent that bracken sharply restricts the height growth of Douglas-fir but has almost no effect on hemlock. Port-Orford-cedar is intermediate. Differences between plots with and without mountain beaver and between fenced and unfenced plots are hardly explainable in terms of animal damage actually controlled in the experiment. More likely they are due to vagaries of rabbit distribution and the partial exclusion of deer on fenced plots.

The difference between species is most likely an inherent quality and not connected with animal damage. Height difference between cover types is probably due partly to damage and partly to the fact that Douglas-fir and Port-Orford-cedar grow more slowly in the bracken type than in the other two types. Hemlock, being more tolerant, would be less affected. This observation is born out for Douglas-fir by the trees in the total exclosures, where the rank in height (with no damage) for the three cover types is the same as on the larger plots. However, there is no doubt that the differences are accentuated by heavier rabbit damage occurring in the bracken.

Summary and Conclusions

This experiment was intended to be exploratory in nature. The findings are based on the results of only one planting on only one

area. Some of the findings are undoubtedly chance occurrences that would not always be repeated under similar circumstances. Nevertheless, the study has produced valuable information on what happens to a plantation in the first four years of its life in an area of high animal populations. The important conclusions are:

1. The plantation was successful in an area where mountain beaver and deer populations were high. After one or two growing seasons it also withstood heavy rabbit damage. Extensive damage, while causing a high percentage of deformed trees and severe reduction of height growth, did not lessen survival appreciably.

2. Rabbit populations built up extremely fast, resulting in extensive damage. It should be assumed that the experimental planting succeeded because of an opportune timing of establishment.

TABLE 3.—HEIGHTS OF SEEDLINGS, BY SOURCES OF VARIATION TESTED

Treatment	Douglas-fir	Port-Orford-cedar	Western hemlock
	Inches	*Inches*	*Inches*
All plots	22.2	12.0	14.5
Mountain beaver present	24.0	13.1	15.2
Mountain beaver absent	20.4	10.8	13.9
Fenced	22.3	14.1	16.2
Unfenced	22.1	9.8	12.9
Grass type	28.4	13.3	15.5
Low brush type	26.7	13.8	14.2
Bracken type	11.6	8.8	13.9

3. Damage from mountain beaver was negligible during the four years of observation.

4. In this mixed planting, Douglas-fir was the most damaged species, although deer did considerable damage to Port-Orford-cedar after the third year. Hemlock seedlings were apparently avoided.

5. Douglas-fir, even though most damaged, was superior to the other species in survival and height growth.

6. Of the cover types observed, heavy bracken seemed to be the poorest risk for a plantation. This was partly due to competition from the bracken and partly to concentration of rabbits in the type, particularly during the summer months.

7. Not all deformity was due to animal damage. Some trees were deformed even where damage was completely prevented.

H. W. Shawhan (1390-1954)

H. W. Shawhan, former West Virginia conservation director, died August 31 at Goshen, W. Va. He was 63 years of age.

Born November 28, 1890 in Cynthiana, Ky., he was a graduate of the old Biltmore Forest School (B.F. 1913; F.E. 1914).

Following employment with lumber companies he was appointed state forester of West Virginia in 1933, and director of the state conservation commission in 1934, which position he held until 1940.

He served as an Army officer in both World Wars, rising from lieutenant to colonel.

Use of Aerial Surveys in Forest Management[1]

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DURING THE LAST ten years aerial photographs and photogrammetric techniques have been used in many professions, particularly forestry and civil engineering. I believe that the forestry profession has been willing to experiment in the use of aerial photography in solving some of its problems more than the engineering profession, although this situation is rapidly changing. I am one of those "hybrid professionals" who originally majored in forestry. Later I qualified in my state as a professional logging engineer, and for the past seven years have derived my livelihood principally from the making of maps by photogrammetric methods. I therefore feel qualified to comment on the relationship of photogrammetry with other professions.

The first thing to clarify in this discussion is a definition of terms. Although photogrammetry has become more or less a common practice there still remains some confusion in its terminology, so I will give my definitions of (1) aerial surveys, (2) aerial photography, (3) photo interpretation, (4) photogrammetry of photogrammetric engineering.

Aerial surveys, implies obtaining data by use of aircraft. Usually this means aerial photography, but not necessarily, as airplanes are used in forestry work without the use of photography for spotting fires, analyzing wind-throw damage, insect damage, etc.

Aerial photography, is the science and technique of taking pictures from aircraft, whether an oblique photograph of a mill site or a precise vertical photograph for map-making purposes. Aerial photography in itself is a profession or business, involving expensive investment in cameras, airplanes, and processing equipment. It also requires years of experience by pilots and photographers to meet the exacting standards of modern aerial photography.

Photo interpretation, covers the subject of the use of terrestial or aerial photographs for identification of ground features such as timber types, geological formations, or points of military significance. Photo interpretation in itself is not a profession, but a technique used by geologists, foresters, or engineers. Interpretation does not require expensive map-making equipment and costly engineering control. It is usually practiced by a forester or a geologist with a set of photographs and a simple stereoscope.

Photogrammetry, or photogrammetric engineering, is the science of making precise engineering measurements from terrestial or aerial photographs. I feel that this is definitely a profession in itself involving years of training and expensive optical equipment. It is usually practiced not by an individual but by an organization for making maps of high standards, using in the process aerial photography as part of the basic data.

As photogrammetry developed in America we have today two subgroups of photogrammetrists. The first group consists usually of professional foresters or engineers who have progressed beyond the photo-interpretation stage in their own skills, and have acquired some simple photogrammetric plotting instruments for making maps. The second group have acquired the complex types of map-making instruments and have made themselves into strictly a map making organization.

I feel that these classifications are of importance to all foresters who are concerned with administrative problems, so that they may better analyze their map-making problems and decide whether they should hire a forester who has knowledge of photogrammetry or take their problems to a concern which specializes in high order map making. This classification has its own parallel within the Forest Service. In many ranger districts, with which I am acquainted, I know foresters who constantly use aerial photographs in their daily work, yet when it comes to making planimetric or topographic maps of a large division of the forest, the Forest Service has its own photogrammetric organization which takes over.

I have listed here various phases of forestry work in which aerial surveys are used. Foresters use aerial photographs in all work involving the making of maps, such as timber type maps, planning maps, fire surveys, topographic maps, and others. In such projects the professional photogrammetrist, the aerial photographer, and the forest-photo interpreter are jointly concerned. For example, in the making of timber type maps our experience indicates that the professional forester, well acquainted with the local conditions in the area to be type mapped and with sufficient knowledge in the use of aerial photographs to use a stereoscope, should be the one to put the type lines on the photograph. He should be sufficiently qualified to analyze the local conditions, make up the original type specifications and have frequent access to the field in which he is working so he may check his work by personal ground observations. In my opinion the mass production of type lines on a photograph by individuals working at some spot remote from the timbered area and with no personal knowledge of local conditions, is not sound.

Making a forest type map is a job for the professionally trained photogrammetrist and always involves some investment in equipment. In this process type lines directly made on the photograph are restituted to a map projection. There are some simple techniques which may be used such as radial line laydown or the use of slotted templates, and simple stereoscopic plot-

[1]Presented at the annual meeting, Society of American Foresters, Colorado Springs, Colo., September 1953.

ters such as the radial line plotter, stereo comparagraph, the K. E. K. plotter, Ryker plotter, and others. This process also involves the securing of engineering control from the field so that the map may be oriented to points of known geographic position. Other types of planimetric maps are made with the use of aerial photographs by similar methods. The methods always involve, first, the photo interpreter who defines on the photograph the features he wants to portray on the map, and second, the photogrammetrist who takes this basic information together with necesssary ground control and makes the map.

Topographic maps on the other hand, always involve the use of costly stereoscopic equipment and an organization capable of undertaking the necessary ground surveys for control purposes and converting these data into precise topographic maps. The conduct of such surveys is generally a job for a professional photogrammetric organization with the necessary equipment and techniques. Frequently the timber cover itself becomes a serious obstacle in determining precise contour location, and is definitely a limiting factor in making precise topographic maps with aerial photography. We have found that the use of photo interpreters with intimate knowledge of local conditions, as described in the making of type maps, is a valuable help in connection with topographic surveys in timbered areas. However, the organization which can work closely with the field in contouring heavy timbered areas can usually come out with better results.

In recent years, foresters by the use of photo interpretation, have brought to light a number of other possible uses of aerial photography in their work. In even-aged stands of timber, for example, tree heights and stand densities can be directly determined on the photograph with reasonable accuracy. If age class can be determined from the field, or by some prior logging or fire records of the area, site qualities can be computed. Thus with very little field information, all the factors necessary for making management plans and growth expectancies can be obtained.

Some logging engineers have made use of aerial photographs in road reconnaissance studies in connection with logging layout engineering. This particular type of work, which comes strictly under the classification of photo interpretation rather than photogrammetry, involves considerable experience in making estimates of degrees of slope and other ground features by direct stereo study of aerial photographs. The forester who uses photographs constantly in his daily work often develops a sixth sense, and is able to make rather accurate studies of a reconnaissance nature without the use of precise map-making equipment.

Another current use of aerial photographs in connection with forestry work includes surveys of insect damage to timber. The Bureau of Entomology and Plant Quarantine has been conducting a series of experiments using color film as well as infra-red and panchromatic film with various filter combinations. I do not believe there has been established as yet a positive system for surveying insect damage, but studies are under way. The state of Oregon, faced with the tremendous task of reforesting the Tillamook burn, has been experimenting with the use of modified infra-red photographs for analyzing the amount of hardwood brush cover in determining planting sites. Bonneville Power Administration has been using aerial photographs for estimating right-of-way clearing costs in connection with powerline surveys.

Probably the greatest use made of aerial photographs in the forestry profession is in timber estimating and inventory problems. The aerial photograph has made it possible to recognize with considerable accuracy various density, size, and species content classes in advance of the ground survey. Since all timber cruising, with the exception of 100 percent ground cruises, is based on statistical sampling of a portion of the timber stand, the actual job of ground sampling is greatly reduced and improved in accuracy by dividing the timber into uniform classes. I shall not go into the details of methods and type mapping and the technical problems of reducing type lines to maps, but I shall comment only on some of the things we have learned in the course of conducting surveys of this type.

The utilization of the timber-type maps, as compiled from aerial photographs in timber cruising work, varies directly with the size of the areas to be cruised. When lump sum estimates are desired on large tracts of timber, the photographic survey becomes almost indispensible. Conversely, on smaller tracts, particularly in connection with commercial buyer or seller cruising problems, the value of using aerial photographs is questionable. It is true that the timber cruiser can save some time on the ground on small tracts by studying the aerial photographs and eliminating areas of unmerchantable value from his ground sample. However, the problem of delivery to a buyer or seller of a commercial cruise by 40-acre tracts of one or two sections of timber, is still a job to be done almost entirely by traditional field cruising methods. Unfortunately, section corners are not visible on an aerial photograph, yet the cruiser must visit and describe each corner poperty so that his estimate may stand up in court. By the time the field cruiser has tied into all the property corners on the small project, he may as well finish the job on the ground. Accepted methods of timber typing on aerial photography by thoroughly identifiable features do not break the stand down into sufficiently fine type classifications to obtain good accuracy on say, 40-acre tracts in most types of timber.

I shall contradict myself, however, by briefly describing a project in which we attempted to produce reliable cruising figures by 40-acre tracts on an area of approximately 200,000 acres. To do this we used an extremely complex timber typing system. We had nine density

classes and eight size classes. Types were broken down in addition by three elevation classes and four aspect classes. The elevation and aspect classes were used primarily because these factors seemed to affect species composition. It was statistically possible on this job to have several hundred thousand possible timber tyes. The sampling was held to a minimum by curving the sample plot data for each class; that is, for density, size, elevation, and aspect so that a volume per acre by species could be calculated for any possible type, regardless of whether or not it was sampled. This project was conducted two years ago. Recently I was presented with a rather intensive series of checks from cut-out records and ground cruising and was amazed to find that in no instance were the errors of volume and species content by 40-acre tracts in excess of the expected accuracy of a two-run ground cruise.

Even though the results of this experiment indicate the soundness of detail aerial surveys, the methods used would not be applicable to all types of timber. I want to caution the enthusiast of aerial volumetric surveys on some serious limitations. It is assumed on all surveys of this type that the timber is stratified into uniform volume classes by the photographic type line. In many cases a timber type may appear to be uniform on the stereo pair of photographs, but actually the type may not be of uniform volume density. This is particularly true of any species of mature timber which is subject to heavy losses in defect and breakage. In portions of central Oregon the defect runs up to 60 percent of the gross volume of timber. This factor is not uniform and may vary greatly from 40 to 40. Consequently, a stand which may appear to be uniform on the photograph may contain great variations in volume. In areas such as described here, the use of the aerial photograph becomes questionable in connection with any detailed volumetric survey.

I want to cover briefly some phases of the problem of professional relationships of photogrammetry and forestry. The photogrammetry profession is now in the stage of development that the profession of forestry found itself twenty years ago. The techniques of map making used by the photogrammetrist are now recognized in our economic life as an essential part of many engineering and forestry projects. A number of interests, private and public, have made large investments in photogrammetric equipment looking to increased use of photogrammetry. With all this development there is, to my knowledge, only one university in the country which gives a student sufficient training to become a professional photogrammetrist. The industry has grown by training its own technical staff, in a country where college graduates are a dime a dozen. It is true that a good many forestry and engineering schools now give courses in photo interpretation. These courses give the student valuable training, as all foresters must and should know something about photo interpretation. We do not, however, train any photogrammetrists in our colleges.

There is a strong and immediate need for liaison between our professional society and similar groups, with the American Society of Photogrammetry. The American Society of Photogrammetry through its committee is doing commendable work in the field of photo interpretation involving the applications of photogrammetry to forestry and other professions.

I feel strongly that some phase of this work should be handled by joint committees of both societies.

There is also the matter of professional registration. In the state of Oregon one is required to hire a professional logging engineer to conduct a logging road survey. If topographic mapping is required for this survey and the work is done entirely with terrestrial surveying instruments, an engineer must be hired. However, if photogrammetry is employed anyone from an ex-navy pilot to a rear chainman may do the job. If the timber is to be appraised for a legal sale, a timber faller or a high climber is usually better qualified to appear in a court case than a professional forester. The two professions have a similar problem here.

One western state is now requiring a land surveyor's or a civil engineer's certificate for the making of photogrammetric maps which, in my opinion, is a forward step. However, the engineering board in this state will not permit experience in making photogrammetric maps to be used by applicants as part of their qualifying experience to become registered. Thus a person could work making maps by photogrammetric means his entire lifetime yet never get the experience required to practice photogrammetry legally.

I have touched on a few of the many possibilities of aerial photography and various photogrammetric techniques which are available to engineers and foresters. We have not yet reached the point where it can be said with certainty how useful aerial photography will become to the forestry profession, but we are surely far from the end of the road.

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The Extent of Natural Conversion to Other Species in the Lake States Aspen-Birch Type[1]

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SUGAR MAPLE, basswood, balsam fir, and other species are now showing up as definite understories in many aspen-birch stands in northern Minnesota, Michigan, and Wisconsin. Ecologically quaking aspen, bigtooth aspen, and paper birch form a pioneer type which if left to nature would eventually be replaced by longer lived or more shade-tolerant species. Foresters are becoming increasingly aware that such successional changes are in fact gradually taking place.

The significance of potential changes in the aspen type is apparent when 39 percent of the commercial forest area in the Lake States is in aspen-birch type according to 1950 Forest Survey estimates. The volume of standing merchantable aspen pulpwood was placed at over 25 million cords, or 43 percent of the total pulpwood stand. The extent to which successional changes may alter the aspen type in the next few decades is the subject of much speculation by foresters and the forest industries of the region.

A review of the literature bearing on this problem disclosed many studies of an ecological nature, but few quantitative data on probable changes in the Lake States aspen type. Therefore, a study was made of successional changes in the aspen-birch type to obtain more information about the trends that are now becoming evident.

Methods Used

Data for a quantitative study of natural conversion were obtained from the original field tally sheets of the current Lake States Forest Survey from plots taken in 1947 to 1950. A total of 1,445 plots in aspen-birch stands in Minnesota, upper Michigan, and Wisconsin were analyzed. The survey plots included tallies or estimates by species of the complete stand including reproduction, saplings, and merchantable timber. By analyzing the stand structure on each plot, data were obtained on the presence of understories of other species in aspen-birch stands.

Preliminary work with the field sheets indicated that there were apparent differences in successional trends in various portions of the Lake States. These differences were obviously related to such varying ecological factors as climate and soil. Recognizing these factors, the region was divided into five ecological sub-regions based on the work of various ecologists and on maps of the soils, forest cover, and climate.

Seedling and sapling aspen stands were found to have a relatively small representation of species from other cover types, but mature pole timber and saw timber plots had a much stronger component of such species. It appeared that a general "thickening up" of understories occurs as aspen stands reach maturity, evidently because of progressive invasion by more tolerant species. For this reason, predictions of conversion were based on conditions now found in aspen pole stands. Forecasts of possible natural conversion were made for the present aspen rotation (10 to 40 years hence, depending on the age of present stands) by computing the percentage of pole timber aspen plots with well-stocked understories of the following cover types: spruce-fir, swamp conifer, pine, oak, ash-elm, northern hardwoods, inferior hardwoods (red maple, elm, ironwood, black cherry, pin cherry), and mixed types.

The area of potential conversion to the above cover types was computed for each ecological subregion for the three Lake States by applying the percent of pole timber plots having these understories to the area of aspen type in each region and state. Estimates were computed for the entire Lake States aspen type with the exception of 1,600,000 acres of "fringe" type in the southern and western limits of the region where no sample plots were available. Data for Wisconsin were limited, and none were available for lower Michigan at the time of this study. However, since conditions in the three states are known to be similar within ecological subregions, conversion estimates from Minnesota and upper Michigan were used to supplement the Wisconsin data and to arrive at figures for lower Michigan.

The relation of aspen site quality to natural conversion was also investigated. Site quality was recorded on the survey tally sheets, permitting tabulation of plots by understory types and stocking classes for good and poor aspen sites.

The effect of present aspen age-class distribution on the timing of successional changes was also analyzed.

Results and Conclusions

The results of this study show conclusively that the shade-tolerant northern hardwoods and balsam fir are the most successful invaders of the aspen-birch type. The pines and oaks are only occasionally able to take over aspen areas.

The findings of this study should not be considered a forecast of what will happen, but rather of what could occur if present trends are not upset by cutting, fires, or other man-caused factors.

Thus qualified, the following conclusions can be drawn from this study:

1. Approximately 5,800,000 acres (32.4 percent of sampled area) of aspen birch type may be completely converted to other types by the

[1]Abstract of report submitted in partial fulfillment of the requirements of the Master of Forestry degree, School of Forestry, University of Minnesota, St. Paul, March 1951. The writer wishes to acknowledge the assistance of all agencies connected with the Lake States Forest Survey in making their records available for this study.

TABLE 1.—ASPEN AREAS CONVERTING TO VARIOUS COVER TYPES IN THE LAKE STATES

Invading types	Estimated areas		
	Minnesota	Wisconsin	Michigan
		M Acres	
Complete conversions:[1]			
Spruce-fir	570	310	550
Swamp conifer	60	80	130
Pine	30	20	30
Oak	60	130	100
Ash-elm	200	270	180
Northern hardwoods	290	1,060	750
Inferior hardwoods	50	110	50
Mixed types	150	300	300
Total area	1,410	2,280	2,110
Partial conversion (all types)	1,020	730	850
No conversion	4,370	2,490	2,640
"Fringe area" not sampled[2]	800	400	400
Present aspen area	7,600	5,900	6,000

[1] "Complete conversions" are based on aspen pole-timber plots containing over 1,050 seedlings per acre of the invading cover type if that type were in the seedling size class; over 650 per acre if in the 1 to 3 inch d.b.h. class; over 350 if in the 3 to 5 inch d.b.h. class; and over 105 if above the 5 inch d.b.h. class. "Partial conversion" includes plots having 600 to 1,049 seedlings per acre; 400 to 649 1- to 3-inch trees; 200 to 349 3- to 5-inch trees; or 65 to 104 trees over 5 inches per acre. Plots containing less than the required stocking for "partial conversion" were deemed too poorly stocked with invading species to give prospects of conversion for the present aspen rotation.

[2] Includes aspen lands at extreme western and southern limits of Lake States range for which no data were available.

year 1990. Some 2,100,000 acres are reverting to northern hardwoods (primarily sugar maple, basswood, and yellow birch); another 1,430,000 acres to spruce-fir type (largely balsam fir); and 750,000 acres may convert to mixed types. Only 80,000 acres are converting to reasonably well-stocked pine stands. Over a million acres are being taken over by low-value types such as scrub oak, red maple, and ash-elm.

2. An additional 2,600,000 acres (14.5 percent of the sampled area) are sufficiently stocked with trees of other cover types to give partial conversion.

3. The remaining 9,500,000 acres (53.1 percent of the sampled area) do not give much promise of conversion within the forseeable future.

4. Complete conversion appears possible on over 40 percent of the type in the Wisconsin-upper Michigan area sampled, while in Minnesota only about 20 percent of the aspen type is being invaded to that extent. Greater competition from hazel and other brush species, plus the role of fires are suggested as partial explanations for this lesser amount of conversion in Minnesota.

5. In Wisconsin and upper Michigan there are indications that conversion will be more complete on good aspen sites than on poor. Good sites are reverting to northern hardwoods, ash-elm, and mixed types. Poor sites are characterized by oak and pine; and 31 percent of all plots on such sites were virtually devoid of trees species other than aspen. The spruce-fir type occurred as an understory beneath aspen about as frequently on good aspen sites as on poor. The relation of site quality to conversion did not appear nearly as clear-cut in Minnesota.

6. The rate of natural conversion should accelerate when the 11 million acres of aspen seedlings and saplings begin to mature, probably about 1965 to 1980.

7. Natural conversion does not appear to offer much hope of restoring pine on five to six million acres of former pine land now occupied by aspen.

8. An unknown acreage of other forest types is undoubtedly being converted to aspen-birch each year by clearcutting, fires, and other man-caused factors. There are no available data that permit an estimate of this factor, hence it is difficult to forsee how the balance between conversion of other types to aspen and conversion of aspen back to such types may shrink or increase the total aspen area in the future.

9. The effect of natural conversion on the supply of aspen, northern hardwoods, and balsam fir may be considerable within the next 30 to 50 years. Predictions are hazardous because of the many unknowns involved, but it appears that there will be at least some decline in aspen supplies and some increase in fir and hardwoods. Further study of the entire conversion picture will be required if more definite information is needed.

Salvaging Lumber Shorts by End Jointing[1]

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TODAY'S LUMBERMAN is faced as never before with the problem of making high-quality products from small, low-grade logs. The inevitable ripping and trimming for grade which he must practice leaves many short pieces of lumber for which there is no ready market.

The advent of really waterproof resin glues makes possible the gluing of these short pieces together endwise, if it is possible to develop a joint which will hold the wood when stressed in bending or in tension. Most of the production type finger joints in use today will only test from 18 to 34 percent of the strength of solid wood when broken either in tension or bending (*1,2*). On the other hand, simple scarf joints of proper slope produce end joints of high strength, but they do not lend themselves to high production, low cost methods of manufacture. In an effort to combine the desirable strength properties of the scarf joint with the desirable production characteristics of the fingered joint, a new type of fingered joint[2] was designed (Figs. 1 and 2).

Joint Strength

When loaded as a beam this new joint will test between 75 and 80 percent of the strength of clear straight-grained southern pine. This means the joint is from two to four times stronger than most of the fingered end joints now in common use. Of the hundreds of joints tested, 134 were in southern pine which would grade dense (6 rings per inch and ⅓ or more summerwood). These 134 jointed beams gave an average modulus of rupture of 11,330 psi, which is 79.8 percent of the 14,210 psi averaged by the clear, dense controls. This strength is actually 4.7 times greater than the working stress (2400 f) assigned to the best stress grades of southern pine.

A number of designs (floor joists, slender columns, etc.) depend more on stiffness than on strength. Evaluation of the modulus of elasticity (a measure of stiffness) is not as yet complete but preliminary tests indicate that the joint has a modulus of elasticity fully as great as that of clear wood.

Methods of Cutting and Gluing the Joints

Joints for laboratory tests were cut with a two-winged solid cutter mounted on a spindle shaper. In commercial production the joints could be cut on a single-end tenoner, a special end-jointing machine or on a flooring end matcher with a glue spreading attachment. Since this joint is reversible, both halves of the joint can be cut on the same cutterhead and the joint made to fit perfectly by turning one board over and pushing it endwise against the other.

After cutting and spreading glue on both members of the joint, the next step is to drive the joint together endwise with from 200 to 400 pounds per square inch end pressure. Once the joint is well seated in this manner, the end pressure can be removed and the joint will not spring back under normal conditions of handling, nor will the members be forced apart when top pressure is applied by a press having sufficiently roughened platens.

The thermosetting resin glues used in the joints can be cured rapidly by the application of heat. If the lumber is rough dressed to ⅞ inch before end jointing, it is possible to secure an initial glue bond in a hot press in about 20 seconds. It is possible to get an initial bond in about the same time with electronic equipment which heats the glue by means of a high frequency radio field. For both these methods, however, somewhat longer cycles are required when it is desired to get the maximum strength and durability.

A third and much simpler method of curing the joints has proved very effective when the end-jointed material is to be used in a laminated member. The pressing and curing of the end joint is accomplished while the member is being laminated. After the end joints have been cut and the glue spread on the joint, the pieces are forced together endwise as previously de-

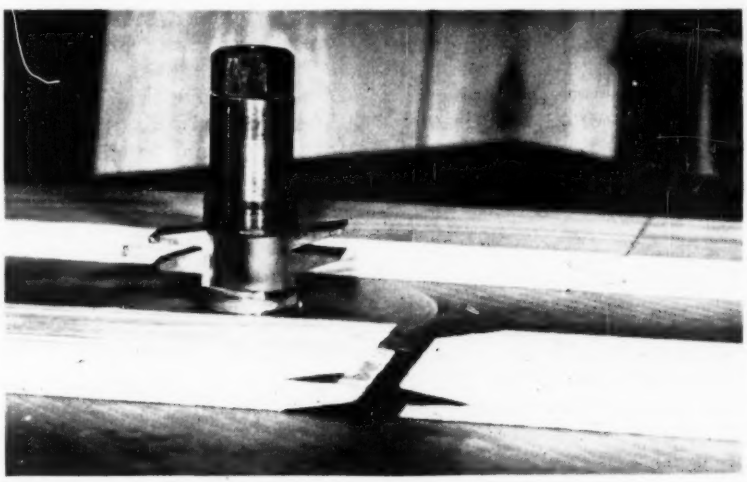

FIG. 1.—The 2-winged solid cutter used in making the end joints in this study. A glued-up joint is shown to the right of the cutter and an unassembled joint is shown in the foreground.

[1]Presented at the annual meeting, Society of American Foresters, Colorado Springs, Colo., September 1953.

[2]Richards, D. B. and B. M. Coal. End joints for southern pines. Leaflet 39, Agric. Expt. Sta., Ala. Poly. Inst., Auburn, March 1953.

scribed. These pieces will now hold together while the glue is spread on the surface of the board. The pieces are then laminated in a laminating press or other suitable equipment and the end joints cured simultaneously with the laminate. This concurrent end jointing and lamination saves an extra pressing and dressing operation and is especially effective in such operations as the lamination of 2 x 4's from short pieces of 1 x 4.

Economics of End Jointing

While there are many places in the lumber industry where end jointing can be of value, two applications will serve as typical examples.

Southern pine 1 x 4's in the B & better grade wholesale for about $160 per M.b.f. B & B shorts from 2-5 feet long usually have a wholesale value less than two-thirds that of regular length stock, or less than $107 per M.b.f. Preliminary estimates show that the total cost for end jointing material of this type will be between $15 and $25 per thousand joints. If the 1 x 4 shorts average 3 feet long (i.e., 1 board foot per piece) then a continuous ribbon of 1 x 4 could be produced at a manufacturing cost of $15 to $25 per M.b.f. Using shorts worth $107 per M.b.f., the cost of producing 1 x 4's of any length would not exceed $132 per M.b.f. Since lumber of that grade wholesales for $160 per M.b.f., the manufacturer could realize $28 profit per M.b.f. The manufacturer, carrying his operation one step further, could edge glue the 1 x 4's into 1 x 12's for an additional cost of from $15 to $20 per M.b.f. and sell the 1 x 12's for $210 per M.b.f., giving a margin for the whole operation of $58 per M.b.f.

In recent years considerable interest has been expressed in laminating 2 x 4 studs out of 1 x 4's. In a study made by the Southern Pine Association and some member

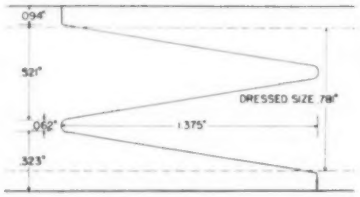

FIG. 2.—The end joint, as viewed from the edge of a 1-inch board. The dotted lines show how the top and bottom truncations will be removed when dressed to 25/32 inch, leaving a 1:6 scarf joint at each surface.

mills, it was found that the operation of laminating No. 2 studs out of 1 x 4's lost about $7 per M.b.f. even when the laminated studs sold at a premium price $5 per M.b.f. higher than solid studs. While this loss might have been lessened by certain changes in laminating technique, it would be difficult to operate profitably as long as the raw materials (No. 2 and the better quality No. 3, 1 x 4's) have a value very close to that of the finished 2 x 4's. However, if, instead of 8-foot No. 2 1x4's at $72 per M.b.f., low-value No. 2 shorts 3 feet long were used the economics of the operation would be practically assured. In fact, it is possible to calculate the minimum length piece which would pay its way through such an operation. The total cost of laminating is $27 per M.b.f. If the end pointing were done simultaneously with the lamination, it would cost only about $15 and not more than $20 per thousand joints. Figuring that No. 2 2x4's wholesale for $83 per M.b.f., $56 per M.b.f. would be left for end jointing ($83 minus $27). Thus there would be 2.8 of these minimum joints per board ft. ($56 divided by $20). In other words, each piece to be jointed could contain as little as 0.357 board feet. If this figure is divided by the .333 board feet per lineal foot in a 1 x 4, it becomes evident that a piece of 1 x 4 which salvages 1.07 lineal feet or 12.9 inches is worth saving. Since the joint itself wastes 1⅜ inches, the original short would have to be about 14.3 inches long just to break even on the end jointing operation.

Uses For End Joints

End jointing offers many interesting possibilities beyond the mere salvage of short pieces of lumber. It permits the production of lumber sizes which cannot readily be produced in a sawmill. One of the most promising possibilities in the use of end joints is to join short boards into long ones and then edge glue these long boards into wide panels in a continuous edge-gluing press. These long, wide panels could be stocked by retail yards and ripped and cross cut to any size the customer might want. These long, wide panels could also be used by commercial laminating firms. For example, 80-foot panels 3-4 feet wide could be glued into a curved laminate from which could be sawed the curved members for bowstring trusses. Curved barn rafters could be resawn from wide, curved laminates in the same manner.

Preservative-treated wood that has had the excess solvent removed by the solvent-recovery process can be satisfactorily end jointed. This means that properly treated wood could be end jointed and edge glued into long, wide panels which in turn could be laminated into heavy arches for the support of highway and railroad bridges. With treated wood extending clear to the center, such structures would be practically immune to rot or termite damage.

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Insect Attacks and Hypoxylon Infections in Aspen[1]

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DURING the past three years the School of Natural Resources of the University of Michigan has been engaged in an intensive study of aspen in the northern half of the Lower Peninsula of Michigan. The objective has been to discover facts that will lead to more effective management so as to meet the rapidly increasing demand for aspen. Both trembling aspen, *Populus tremuloides* Michx. and bigtooth aspen, *Populus grandidentata* Michx., have received attention in proportion to their natural occurrence; bigtooth being the more important species in the Lower Peninsula.

One of the striking characteristics of both aspen species is their relatively short life span; it is unusual in Michigan to observe trees one hundred years of age or older, and stands usually begin to deteriorate, even on medium sites, between forty and fifty years. On the poorer commercial sites, the stands may begin to break up between twenty-five and thirty-five years. The evaluation of the various causes associated with this decline is an important phase of the aspen study, and some facts have been discovered that should be reported upon.

Causes of Deterioration

Various organisms are associated with decadence, some of which are definitely secondary in that they can only attack and develop in dead or dying trees or parts of trees. Some others are mildly parasitic whereas still others seem to be highly parasitic.

Hypoxylon canker caused by the fungus, *Hypoxylon pruinatum* (Klotsche) Cke. belongs in the last category, and is the most destructive disease of trembling aspen in southern Michigan.

When this study of the causes of aspen deterioration was undertaken it was believed that intensive work on hypoxylon might lead to unnecessary duplication of a comprehensive study of the canker already underway in the Lake States. Therefore, only the most obvious facts concerning the prevalence of the cankers were recorded. However, it soon become apparent that the disease was worthy of greater attention for two reasons: first, because of its general prevalence, and secondly, because of the association of insect injury and the cankers. On the 416 tenth-acre sample plots established in the course of the study, 22 percent of all trembling aspens and 4.8 percent of all bigtooth aspens were cankered. The annual mortality due to hypoxylon cankers totals in the neighborhood of 295,000 cords of merchantable wood in the Lower Peninsula of Michigan alone. Insect tunnels were almost universally associated with the cankers, but in the great majority of cases, it was not clear that the insect injury had provided the initial avenue of infection. However, it seemed important to establish if and to what extent insect injury does provide the infection court for hypoxylon.

Therefore, during the field seasons of 1952 and 1953, a search was made for new insect attacks and new hypoxylon infections. Special attention was paid to those infections located on the main trunk of the trees. Many new insect oviposition points were found and identified, but most of them were not infected when observed. New cankers were difficult to find and identify with certainty. Over 600 cankers were examined on the plots and approximately an equal number on other areas. The majority had developed to the point where the infection court had been obscured either by the fungus itself or by the invasion of secondary insects.

Only in 138 instances was it possible to identify both the fungus and the infection court. In all instances where there was any doubt of the identity of the fungus, cultures were made and compared with hypoxylon spore cultures. Some, originally suspected of being caused by hypoxylon, either were caused by another agency or the cultures produced an uninterpretable mixture of organisms. These cases are not included in the 138 mentioned above.

Insect Tunnels Associated With Hypoxylon Infection

Of the 138 identifiable cankers on the main stem of merchantable trees, 131, or 95 percent originated in insect injuries (Table 1). In 60 percent of these, the fungus gained entrance through the tunnels of three species of insects and another 14 percent entered through the tunnels of a group of lepidopterous borers. This is not so surprising, however, when it is realized that these insects cause the vast majority of the wounds on aspen trees.

Of the cankers tabulated in 1952, half of the infections occurred in wounds caused by the poplar borer (*Saperda calcarata* Say), but in 1953 this insect was responsible for only 10 percent of the recorded infections. This difference is explained by the fact that the poplar borer in general follows a cycle, with a peak of abundance every third year. The summer of 1952 was a peak year, whereas in 1953 adults were scarce and new injuries caused by this insect were rarely observed.

Habits of Borers That Encourage Hypoxylon Infection

The habits of the poplar borer are such that infection by hypoxylon is encouraged both directly and indirectly: directly by exposing the wood to infection, and indirectly by increasing the probability of attack by both the borer and the fungus through thinning the crowns of the dominant and

[1]Paper No. 1, Phoenix Project 29, Aspen Study. Financed by special contributions from wood-using industries and others.

TABLE 1.—NUMBER AND PERCENT OF HYPOXYLON CANKERS RESULTING FROM VARIOUS TYPES OF INJURIES

Type of injury	Trembling aspen				Bigtooth aspen				Both species				Total	
	No. of cankers		Percent[1]		No. of cankers		Percent		No. of cankers		Percent		No. of cankers	Percent
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953		
Saperda calcarata	29	7	52	15	5	0	39	0	34	7	50	10	41	30
Dicerca tenebrica	3	14	5	30	0	3	0	14	3	17	4	24	20	15
Lepidopterous borers	4	4	7	9	3	8	23	36	7	12	10	17	19	14
Agrilus spp.	8	2	14	4	3	8	23	36	11	10	16	14	21	15
Other Cerambycidae	3	8	5	17	0	2	0	9	3	10	4	14	13	9
Agromyzidae	5	2	9	4	0	0	0	0	5	2	8	3	7	5
Other insects	2	6	4	13	2	0	15	0	4	6	5	11	10	7
Mechanical	2	0	4	0	0	0	0	0	2	0	3	0	2	1
Unknown	0	4	0	8	0	1	0	5	0	5	0	7	5	4
	56	47	100	100	13	22	100	100	69	71	100	100	138	100

[1]Figures equal nearest whole percent.

codominant trees by girdling branches and the main trunks.

The female beetles lay their eggs in slits which they cut into the bark for oviposition. The smooth bark of trunks and limbs over 2½ inches in diameter are favored. Slits may be cut either on healthy or decadent trees, but exposure of the bark to direct rays of the sun is conducive to this activity. On the more vigorous trees, the beetles cut many holes in which they do not deposit eggs. When oviposition does occur on healthy trees, many of the eggs either fail to hatch, or the larvae soon die. In more decadent trees, however, a high proportion of the larvae develop, girdling the branch or trunk.

On the basis of this study, it appears that infection by hypoxylon occurs most frequently in barren egg slits and in the small cavities cut in the sapwood shortly after the eggs hatch. On the other hand, after the larvae tunnel away from the point of entrance, infection seldom occurs, even though the larvae continue to move back and forth in their galleries and maintain an opening through the oviposition slit for disposal of frass and borings. However, where the larger larvae cut additional openings to the outside, infections frequently occur.

Although the poplar borer contributes to hypoxylon infection, the fungus inhibits the multiplication of the insect. Whenever the tissue surrounding an egg slit or a new larval mine becomes infected, the fungus destroys the fresh tissue faster than the larva can extend its tunnel, and the insect perishes.

This interaction of the fungus and insects will be studied further, but observations already made indicate that variations in weather from season to season have a striking influence upon both the insects and the fungus—moist weather favoring the fungus, and dry weather the insects. Under severe drought conditions, the vitality of normally healthy aspens may be so reduced that girdling by the poplar borer may kill or severely injure many trees in a stand. In contrast, during moist years, little injury occurs because practically all the larvae working in healthy trees will die. The only evidence of these unsuccessful attacks is the roughened dark spot of bark that develops over each slit.

With the exception of *S. calcarata*, more cankers were found associated with tunnels of *Agrilus* spp. than any other insect. However, the aspen agrilus is a secondary insect and can breed successfully only in dying trees. It is not surprising therefore that oviposition occurs most commonly on seriously suppressed trees, trees that have been exposed suddenly and those that bear cankers in advanced stages.

The eggs of *Agrilus* spp. are laid in the crevices in roughened bark. When the larvae hatch, they bore through the bottom of the egg and through the bark. When the eggs are deposited on moderately vigorous trees, the larvae tunnel horizontally on reaching the phloem instead of cutting the usual sinuous tunnels between bark and wood. Drying and shrinking of the green tissues causes the bark to crack, thus providing an avenue for infection. Often there is a flow of sap from these cracks, much the same as that around the advancing margin of hypoxylon cankers. This exudation is fed on by various sap-feeding insects and it seems likely that these sap-eaters may directly transmit the fungus spores to these wounds. However, such a postulation is not necessary to account for most of the infections.

Another insect, *Dicerca tenebrica* Kby., one of the larger metallic woodborers, is responsible for most of the cankers in low quality stands. The eggs of this insect are laid in July and August, on the rough bark around branches and branch stubs. The larvae bore down through the bark to the sapwood, but unlike those of Agrilus, make a relatively large opening through the bark. *D. tenebrica* is even more of a sun-loving beetle than the poplar borer and breeds only in exposed trees.

The lepidopterous wood borers that often provide an infection court are members of three families, two species in the family Cossidae, one in the Aegeridae, and one in the Pyralididae. Their habits are rather similar and therefore they will be discussed as a group.

The female moths lay their eggs in the callus tissue around branch stubs or unhealed wounds. When the eggs hatch, the small larvae feed extensively in the phloem and the spongy parenchymatous tissue of the callus. As they become larg-

er, they work deeper into the wood. An opening is maintained to the outside through which frass is ejected. Almost any unhealed wound provides a suitable oviposition site for these moths. However, the cossids show a decided preference for abandoned tunnels of *S. calcarata*, while the aegerids prefer to lay their eggs near dead branch stubs.

If further investigations verify the observations made during 1952 and 1953, then the reduction of the types of insect injury described in the preceding paragraphs would bring about a marked reduction in the number of potential infection courts suitable for hypoxylon. From this we may logically conclude that the amelioration of the currently serious hypoxylon situation might be accomplished through control of insects.

On the other hand it should be recognized that the work reported herein has been confined to the lower peninsula of Michigan. We should expect that in other localities still other insect species would be responsible for creating suitable infection courts, or that other causes of injury might be responsible.

In considering the influence of insects and fungi on aspen stands another point should not be overlooked. Neither all hypoxylon infections nor all insect attacks are undesirable. On many areas the death of a part of the stand, especially the suppressed and intermediate individuals, will improve the health of the residual trees. Their gradual removal through the work of fungi and insects will result in less disturbance than would a conventional thinning operation. Furthermore thinning by axe or chemicals, desirable though it might be silviculturally, is usually financially impracticable in aspen stands.

Therefore, agrilus attacks, so common in suppressed trees, and the associated fungal infections are actually desirable from man's viewpoint. At a meeting of the Michigan Academy of Science in the spring of 1953 the junior author pointed out these facts, and suggested the possible use of artificially produced hypoxylon infections as a cheap method of thinning aspen stands. If by introducing hypoxylon spores into suitable injuries, made by bruising or puncturing the bark, those trees that should be removed can be killed, we should have at our disposal an economical means of thinning. Agrilus often accomplishes this end without the aid of the forester.

In contrast to agrilus attacks the injury caused by most other insects is frequently observed on the more desirable trees in a stand. Saperda and other cerambycids, Dicerca, agromyzids, and several lepidopterous borers are in this category. In general their attack is favored by thin crowns with branches and trunks exposed to sunlight, a condition that often results from excessive competition and low vigor. Crown condition may be improved by thinning. If we cannot afford to thin aspen stands we may expect nature to do it for us, especially during periods of drought. At such times a part of the trees will be killed by various agencies and a general improvement in health of residual stand will follow. Our present stands have experienced such thinnings several times since their establishment.

In aspen stands the sudden creation of openings in the crown canopy may lead to increased attacks by saperda and other insects. Such openings are frequently produced by the death of scattered wolf trees. To avoid the development of wolf trees in the future, aspen stands should be clear cut and this should be followed as far as practicable by killing the residual unmerchantable trees that do not die within a few years after logging. The result will be a stand of even-aged root suckers that will be less subject to damage associated with the sudden opening of the crown canopy than are present day stands.

Conclusions

A strikingly important relationship has been demonstrated to exist between hypoxylon canker and insects of aspen. In more than 95 percent of all hypoxylon cankers, observed in the Lower Peninsula of Michigan, where the cause of the infection court could be positively determined, insects were responsible for the initial injury. Three beetle species were responsible for 60 percent of the courts. Since by silvicultural practices the abundance of these insects and the injury caused by them may be materially reduced, we may have at our disposal a means by which the number of hypoxylon infections can also be reduced.

Growing Stock in the All-Aged Forest

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This article raises some fundamental questions about traditional concepts of all-aged growing stock. The author uses the performance of loblolly pine in southern Arkansas to illustrate his points.

HARDLY A FORESTER is practicing his profession today who has not had to struggle with the question of "What is desirable or normal stocking for the managed all-aged forest?" In considering this problem many foresters have assumed, and many professors of forestry have taught, that all-aged forests are in effect even-aged, but with each age class represented on each acre. They have further assumed that the desirable diameter distribution for the fully stocked all-aged forest can be obtained from normal yield tables for even-aged forests. No doubt such assumptions simplify the subject—but are they realistic?

Growing Stock of Even-Aged Forests

The approximate proportions of age-classes for the even-aged forest are not difficult to determine. The regulation is by area, and theoretically the number of age-classes equals the number of years in the rotation divided by the number of years in the seeding or cutting cycle. Each age class occupies an equal area of land.

The diameter distribution pattern for the normal or fully stocked even-aged forest can be approximated by making use of yield tables. For loblolly pine on a 70-year rotation and in 5-year age classes, the purpose is served by a table such as Number 162 in *Volume, Yield, and Stand Tables for Second Growth Southern Pines*.[1] Table 1 has been constructed from this source as an example. The table assumes that each of the 14 age classes will occupy equal portions of the composite average acre.

It may seem that the normal stand, as depicted in Table 1, is too heavy for maximum growth under either even-aged or all-aged management. However, a reduction in growing stock under management might well be proportional in all diameter classes, and on the average acre trees 12 inches in d.b.h. and smaller might well occupy approximately 12/20ths (60 percent) of the ground. They might also (Table 1) still comprise nearly 60 percent (57.4) of the total cubic volume of the stand. Regardless of how the forester manipulates the level of total growing stock, there is a fixed age-class and diameter-distribution pattern for fully stocked even-aged forests.

Growing Stock of All-Aged Forests in Europe

The same thing cannot be said for managed all-aged stands. There is a big difference of opinion both as to what growing stock the well-stocked all-aged forest should contain and as to the best diameter distribution. If it is assumed that the difference between the two methods of silviculture is only that of arrangement of trees on the individual acre, then a fully stocked acre of selection forest should look something like the one built up in Table 1 for the even-aged forest. Is this the shape of the fully stocked all-aged forest of the future or will it be something else?

Schlich suggests that "Theoretically speaking, in a normal selection forest all age gradations should be represented in the same proportion as in the system of clear cutting in high forest; hence the volume should be the same in both cases. In practice, however, this is rarely, if ever, the case. As a general rule, the older age classes occupy more area than the younger ones."[2] In theory, then, all-aged stands should have the same proportions of age or diameter classes as even-aged stands, but in practice more of the growing space in all-aged stands is used by larger trees that are producing board-foot volume growth and less by those small diameter classes that are producing cubic-foot growth only.

Another theory that is often used to determine the number of trees required for proper diameter distribution in the well-managed all-aged stand is the law advanced by Liocourt, a French forester who lived from 1860 to 1928. This law suggests that the number of trees in each 5-centimeter (roughly, 2-inch) diameter class bears a constant geometric ratio to the trees in the next larger class. In French for-

[1] U. S. Dept. Agric., Misc. Pub. 50, 202 pp. 1929.

[2] Schlich, W. Manual of forestry. Ed. 5, vol. III, pp. 219-20. 1925.

TABLE 1.—DIAMETER DISTRIBUTION ON AVERAGE ACRE OF NORMAL EVEN-AGED LOBLOLLY PINE FOREST, ASSUMING A 70-YEAR ROTATION AND EQUAL AREAS IN EACH OF 14 AGE CLASSES

D.b.h. class	Trees	Volume inside bark	Proportion of trees 4 inches d.b.h. and larger	Proportion of trees 8 inches d.b.h. and larger	Proportion of cu. vol. 4 inches d.b.h. and larger	Proportion of cu. vol. 8 inches d.b.h. and larger
Inches	*Number*	*Cu. ft.*			*Percent*	
4	93.64	75				
6	64.43	200	52.7	—	9.0	
8	47.36	369				
10	35.36	499	36.6	77.4	48.4	53.2
12	26.93	603				
14	17.29	555				
16	9.07	391	10.6	22.3	41.4	45.5
18	3.86	214				
20	1.43	100				
22	.43	37	.1	.3	1.2	1.3
Total	299.80	3,043	100.0	100.0	100.0	100.0

ests of oak, beech, spruce, and fir, Liocourt found this ratio to be about 140 percent, and this is the figure that has most often been applied to loblolly pine in this country.

Some loblolly pines in south Arkansas will grow well until they have reached 26 inches in diameter. If we assume that the largest tree we will grow in our managed stands is of this size and that we have one of these per acre, we can compute the desired stocking for our all-aged stands by applying Liocourt's ratio. Table 2 is the result of such a computation, again with loblolly as an example.

Now, instead of having a total of 300 trees per acre in the 4-inch d.b.h. and larger classes (as computed by use of normal yield tables), we have 139. Instead of having 57 percent of the cubic volume of our growing stock in trees below 12 inches d.b.h. (sawlog size) we have only 36 percent. In other words, the larger trees occupy much more of the effective growing space under Liocourt's assumption of desirable stocking than under the assumption of the normal yield table.

The Swiss foresters, who have had more experience with the selection or all-aged system than any other group, also have ideas regarding the growing stock in such forests. Huber,[3] in writing about the experience of Biolley and Knuchel with the selection system in the state forests in the Canton of Neuchatel, suggests, "The efforts of the silviculturists will as a rule go toward obtaining as high a proportion of large trees (which represent the most valuable timber) as possible without a decrease of increment. The higher the site, the higher may be the proportion of large trees one can maintain without risking over-maturity."

In the selection forest of Couvet, over a period of 50 years, the Swiss have gradually decreased the proportion of the small (7 to 13 inches d.b.h.) growing stock from 24 to 12 percent and increased the proportion of the large sizes (21 inches d.b.h. and over) from 27 to 57 percent of total stand volume (Fig. 1). "At the same time," Knuchel[4] comments, "the structure of the forest has changed considerably. What cannot be seen from these figures is that the quality of the trees has markedly improved in that increment has been concentrated more and more on the most valuable stems."

R. Bourne,[5] who worked with all-aged beech forests in England, suggests, "The technique of fostering advance growth and allowing it to develop, to make uneven-aged and uneven canopies, has enabled foresters to ignore the need to maintain a series of areas of age gradations. Recruitment takes place all over the forest, and instead of control being by age and area, it is by volume, the largest trees only being cut to harvest the increment and maintain the growing stock. Not only are the areas occupied by each age class mixed over the whole forest, but owing to the use that can be made of side light, and mixtures in which the tree roots share varying levels of the soil, the spaces occupied by each age class are telescoped and shared."

An All-Aged Compartment at Crossett

What should the "normal" or desirably stocked all-aged managed loblolly pine forest look like? What constitutes good diameter distribution for stands where high-grade sawlogs are the primary goal? The answers will probably be available about 50 years from now. In the meantime, what are the indications?

The good farm forestry forty (Compartment 51) on the Crossett Experimental Forest in southern Arkansas may be used as an example of desirable distribution for all-aged loblolly pine on reasonably good sites (85 feet at 50 years).

This area of 40 acres of shortleaf-loblolly pine-hardwood was originally cut over to a 12-inch diameter limit in 1915. In 1937, when it was placed under intensive management as a farm forest, pines 4 inches d.b.h. and larger averaged 133 per acre. The largest trees were 25 inches in diameter. There were many more trees in the small sizes than in the large sizes. Thirty-four percent of the total cubic-foot volume of all pine trees in the

[3]Huber, Alfred. Examination of sustained yield management by the volume and increment control method. Pulp and Paper Magazine of Canada. Vol. 53, pp. 106-113. Jan. 1952.

[4]Knuchel, H. Management control in selection forest. Imp. Forestry Bur., Tech. Commun. 5, 32 pp. Oxford, Eng. 1946.

[5]Bourne, R. A fallacy in the theory of growing stock. Forestry 24:6-18. 1951.

TABLE 2.—STOCKING OF A SELECTION FOREST AS COMPUTED BY USE OF LIOCOURT'S RATIO, ASSUMING THAT MAXIMUM SIZE OF TREE TO BE GROWN IS 26 INCHES D.B.H. AND THAT ONE SUCH TREE WILL BE PRESENT ON EACH ACRE

D.b.h. class	Trees	Volume inside bark	Proportion of trees		Proportion of cu. vol.	
			4 inches d.b.h. and larger	8 inches d.b.h. and larger	4 inches d.b.h. and larger	8 inches d.b.h. and larger
Inches	*Number*	*Cu. ft.*	*Percent*			
4	40.49	32.39				
6	28.92	89.65	49.9		6.0	
8	20.66	161.15				
10	14.76	208.12	33.0	65.8	29.7	31.6
12	10.54	236.10				
14	7.53	241.71				
16	5.38	232.42	14.0	27.9	43.0	45.8
18	3.84	211.58				
20	2.74	190.98				
22	1.96	169.34				
24	1.40	144.48	3.1	6.2	21.3	22.6
26	1.00	119.20				
Total	139.22	2,037.12	100.0	100.0	100.0	100.0

stand was in the 7- to 13-inch group, and 10 percent was in the 21-inch and larger group (Fig. 2). Basal area of pine was 67 square feet per acre. Volume of pine 12 inches d.b.h. and larger averaged 6,700 board-feet (International ¼-inch rule) per acre.

Management of the area provided for an annual cut approximately equal to the average annual cubic volume growth. The silvicultural system was a modified single-tree selection system that permitted the cutting or leaving of a given tree according to its quality or growth rate, or according to the need for thinning. Almost without exception, the mature and poorer quality trees were the ones removed. The best trees were left, regardless of size, as long as they were growing at least three inches in diameter in 10 years, or seemed likely to grow this fast if competing trees were removed.

At one time it was thought that most loblolly pines would be financially and biologically mature at 20 inches d.b.h. Fifteen years of intensive management of this area has proved that this is not the case. The number of trees 20 inches and larger in diameter is now twice as great as in 1937 and the diameter growth rate for this size group is the best of any in the stand. Many of these larger trees are growing at the rate of 20 to 40 board feet (International ¼-inch rule) per tree per year. If one considers the quality of the material being laid on as well as the volume growth, many of these stems are increasing in stumpage value at the rate of $1.50 to $2.50 per tree per year. There is no question but that the dollar return per acre occupied by such trees is greater than it would be for any combination of trees of smaller sizes. Such large trees are very desirable growing stock and really make money for the owner.

Since 1937 the cubic volume of pine in the small sizes has decreased from 34 percent of the total stand volume to 19 percent (Fig. 2), the volume of the medium size group has increased from 56 to 61 percent, and the volume in the large sizes has increased from 10 percent to 20 percent. Board-foot growth has increased from 287 to 702 board feet (International ¼-inch rule) per acre per year.

It is much too soon to suggest that the development of the loblolly pine stand structure on the good forty will be similar to that of the selection forests of Couvet, Switzerland, but it is interesting to compare Figure 2 with the development of the Swiss forests as shown in Figure 1. On-the-ground inspection of the Crossett forest indicates that a greatly increased amount of large timber could be supported without having this size group use the area needed by seedlings and small- and medium-size trees. In fact, where the stocking is not too heavy, it is quite apparent that once the trees reach the upper medium or large sizes and get their crowns high off the ground, reproduction will start directly under these crowns and will grow at only a slightly reduced rate until the crowns of the small and the large trees touch (Fig. 3). It undoubtedly will be possible to telescope some size classes and grow them on the same ground, one with the other.

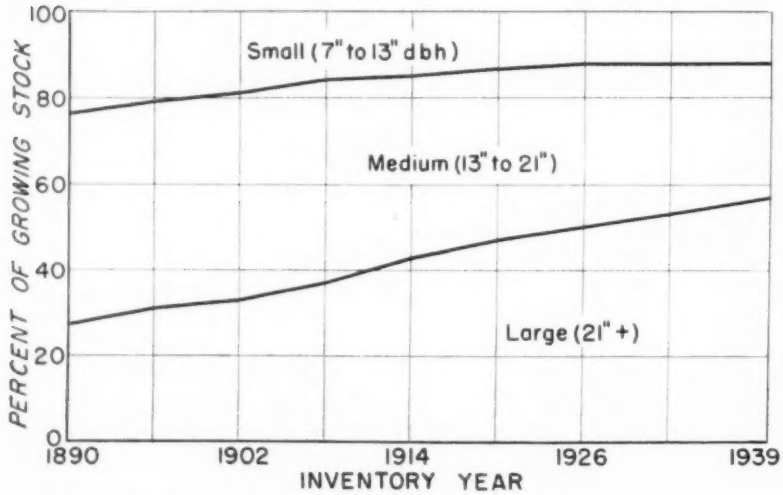

FIG. 1.—Changes in distribution of cubic-foot volume of growing stock in the selection forests of Couvet, Switzerland, 1890 to 1939. (After Knuchel.)

Toward a New Concept of All-Aged Growing Stock

Do we need a new theory of normal growing stock in the all-aged forest?

Certainly the all-aged loblolly pine stand and stock table as developed from even-aged normal yield tables seems unrealistic. The number of trees and the proportion of total area occupied is much too large for the diameter classes below 12 inches d.b.h. and much too small for the larger sizes. The standard as set up by use of Liocourt's ratio comes much closer to the stand structure that has developed in the Swiss forests and to that which seems to be developing on the Crossett forest.

However, Liocourt's law has its weaknesses. The structure it implies is too dependent upon a pure guess as to the largest size tree that would be grown and upon the number of trees of this size that would occur per acre. The 140 ratio also appears to provide a much greater number of small trees than are needed to supply replacements for the large trees that are cut. There seems to be no good reason for allowing almost a 30-percent loss of trees (cutting plus mortality) in the few years it takes loblolly pine to grow from one 2-inch diameter class into the next.

Although it is impossible at the moment to generalize and set up

desirable "normal" or full stocking patterns for all-aged forests, experience in managing the stands at Crossett over the last 15 years offers some clues to the solution of the problem.

In the first place, a high rate of board-foot growth of large, high-grade sawlogs is not dependent upon heavy cubic-foot stocking. The good farm forestry forty, with 36 trees per acre in the 12-inch d.b.h. and larger classes, is growing 702 board feet (International ¼-inch rule) per acre per year. The poor farm forestry forty (Compartment 56), with 25 trees of smaller average size but still 12 inches in d.b.h. and larger, is growing 461 board feet. Surely it is unnecessary to have from 150 to 250 trees per acre in the 4- to 12-inch d.b.h. group in order to provide replacements for the few larger trees that will be removed at the end of each 5- or 10-year cycle.

A good stocking of small trees is desirable in portions of the all-aged forest to ensure natural pruning. The number of trees needed for this purpose, however, is much less than in even-aged stands because competition from the large trees helps to clean the small ones.

The sea of thousands of stems of pine reproduction that many foresters associate with successful forestry is not necessary to all-aged saw log management. With good fire protection, perhaps 10 established seedlings for every mature tree cut will suffice.

Furthermore, wood technologists have recently found indications that pulp yield and timber strength are correlated with specific gravity, and that specific gravity is correlated with the age from meristem (number of rings to pith). Hence, we should get more pulp and stronger lumber by channeling the volume growth potential of an acre onto larger, older trees. Seedlings can be allowed to accumulate age and height but little volume until they are needed for recruits; then their growth can be speeded up. Specific gravity seems to be little affected by rate of growth, so fast growth on old trees and slow growth on young trees should produce maximum benefits.

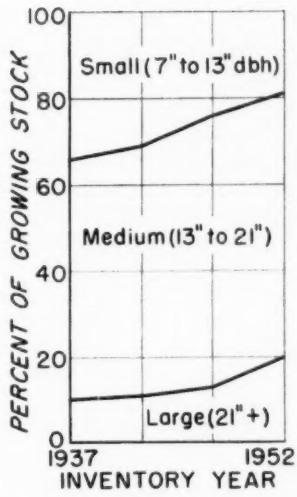

FIG. 2.—Change in distribution of cubic-foot volume of all-aged growing stock on Compartment 51 of the Crossett Experimental Forest, 1937 to 1952.

Where large sawlogs are the main end product, it seems logical to conclude that as much of the growth capacity of the site as is consistent with sustained production should be concentrated on the upper medium and large sizes. The large trees have large crowns because they are above the rest of the stands and have plenty of rooms in which to develop. The large sizes, therefore, tend to occupy more of the available space and produce more growth per tree than trees of similar size in even-aged stands. The smaller sizes do not need as much of the growing space as they do in even-aged stands. For these reasons, full stocking for maximum board-foot growth in all-aged stands may be only one-half or at most two-thirds of the even-aged concept of full stocking.

FIG. 3.—All-aged stand at Crossett. Eighty percent of the cubic volume is in trees 13 inches d.b.h. and larger. Reproduction occurs in the understory and in small openings.

Hardboard Manufacturing Possibilities for the Rocky Mountain Territory[1]

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Some factors to consider in evaluating the possibilities of hardboard manufacture for the Rocky Mountain territory are suitability, availability and comparative cost of raw material, and capital investment requirements for hardboard production. While the present status of the domestic industry is shown, future demand for the product cannot be predicted. It is hoped that the market growth of recent years will continue, since hardboard production is a stimulating improvement in wood utilization. It is recommended, however, that anyone interested in hardboard manufacture make a thorough analysis of all factors affecting the success of such a venture.

THE RECENT GROWTH of the United State's hardboard industry has been a real stimulant to those concerned with wood utilization because the manufacture of consolidated board products offers one of the more economically sound methods of using large tonnages of wood residues or timber of low value. As such, it represents an important milestone on the road to complete wood utilization.

Expansion of the hardboard industry is an encouraging measure of the increased acceptance of panel or board products made from wood. Important wood-base panel products include plywood, paperboard or wall board, insulating board, hardboard, particle board, and paper-covered veneer. Although these products compete with each other, they often serve as companion products to expand the use of all. The increasing diversity of wood-base products places wood in a stronger competitive position with products of gypsum, metal, or other materials.

Since this discussion is to be limited to hardboard manufacturing possibilities it is important to define the product. The newly created Hardboard Association has stated, "Hardboard shall comprise interfelted lignocellulosic wood fibers consolidated under heat and pressure into a board characterized by a natural ligneous bond." Although this definition is not unanimously accepted it will serve for the present to distinguish hardboard from particle boards. Particle boards are produced by bonding wood particles considerably larger than fibers or fiber bundles (e.g. shavings, sawdust, or the like). Hardboard usually can be distinguished from other wood-base materials by differences in density. Lewis[2] has proposed the following density classification:

Material	Specific gravity
Semi-rigid insulation board	0.02 – 0.15
Rigid insulation board	0.15 – 0.40
Intermediate density board	0.40 – 0.80
Hardboard, untreated or treated	0.80 – 1.15

Particle boards cannot be separated readily from hardboards on the basis of density, for most particle boards have a specific gravity of 0.65 to 1.00.

Present Status of the Industry

During the past six years the domestic output of hardboard has more than doubled, while the number of plants in the United States has increased from two to ten. At least two additional plants will begin production in 1954. Domestic productive capacity now exceeds annually, one and one-half billion square feet of ⅛-inch board—or about one-half the production of softwood plywood (⅛-inch hardboard compared with ⅜-inch plywood).

No attempt is made here to forecast the potential market, since product diversification and active sales promotion may create a continually expanding market similar to those enjoyed by plywood and many paper products. In 1951, the reported domestic per capita consumptions of hardboard, insulating board, and softwood plywood were 8, 12, and 17.5 square feet respectively.

Manufacturing Possibilities in the Rocky Mountain Territory

The possibilities for profitable manufacture of hardboard in the Rocky Mountain territory depend upon a number of factors, chief of which are: (1) availability and cost of raw material, (2) potential markets and their location, (3) availability of investment capital, and (4) water supply and process water disposal. The availability of such items as labor, power, and transportation facilities should present less critical problems. Major attention will be devoted here to the questions of raw material and capital investment.

Raw Material Availability and Costs

Many species have been used to produce satisfactory hardboards experimentally, but a few softwoods (including southern pine, Douglas-fir, and redwood) have supplied the bulk of commercial production. Rocky Mountain species such as lodgepole pine, Engelmann spruce, and the true firs, being well suited for groundwood pulp, should produce excellent hardboards; western white pine, western larch and ponderosa pine should be acceptable species although the latter may present some special problems because of its high resin content. Recently completed studies at the Oregon Forest Products Laboratory have demonstrated that lodgepole pine is well suited for hardboard production.

Although most species growing in the Rocky Mountain region possess suitable characteristics, wood costs in this area may exceed present costs in other regions. This is

[1]Presented at the annual meeting, Society of American Foresters, Colorado Springs, Colo., September 1953.

[2]Lewis, Wayne C. The hardboard industry in the United States. Jour. Forest Products Res. Soc. Vol. 2, No. 4. November 1952.

particularly true if anticipated costs are compared with present wood costs to hardboard plants in the Pacific Northwest. Since these Pacific Northwest plants use sawmill or veneer plant residues developed at nearby mills, their delivered wood costs should not exceed ten dollars per unit of chips. A unit of chips (200 cubic feet bulk volume) contains about 70 cubic feet (more when packed) of solid wood—roughly equivalent to a cord of wood—and has a dry weight of one ton or more, depending upon the species.

Thus, plants dependent upon logs or cordwood would be at some disadvantage from the standpoint of raw material costs. If chips from cordwood cost twenty dollars per unit, or ten dollars more than those produced from slabs, edgings, etc., the manufactured cost of 1/8-inch board would be increased approximately four dollars per thousand square feet. There are sufficient sawmill slabs, edgings, and trim produced annually in the Rocky Mountain territory to supply the entire United States hardboard production. The problem, however, is to obtain a concentrated volume in a central location.

A few existing hardboard plants have capacities of about two million square feet per month. Since 1/8-inch board weighs 750 pounds per thousand square feet, and fiber yields usually are 90 percent or more of the wood weight, such a plant would require approximately 800 tons of wood per month. This means that a sawmill operating 5 days per week would need to produce 40 tons of chippable wood residues per day. To produce 40 tons of bark-free chips from slabs, edgings, and trims a mill without a log barker should cut about 160 M.b.m. of logs. A mill equipped with a whole log barker could produce the same volume of chips from 80 M.b.m. of logs. One commercial hardboard process permits the inclusion of bark and, therefore, presents a different situation.

Indications are that the most economical hardboard plant may be one with a minimum daily capacity of 70 tons of board. Such a plant would require almost double the volume of wood mentioned in the previous paragraph.

Plant Investment Costs

A concentrated raw material supply is not the only problem raised by a 70-ton-per-day plant. Investment costs have been reported as $10,000-$20,000 per ton of daily capacity for dry-process plants and $20,000-$40,000 per ton for wet-process plants. Judging from recent cost estimates made by the Oregon Forest Products Laboratory, present investment costs are considerably higher—about $25,000 per ton of daily capacity for dry-process plants. Costs are appreciably higher for wet-process plants. Although smaller plant investments are possible, lower plant investments usually result in higher production costs per unit output. In brief, capital investment costs for hardboard plants are considerably lower than for pulp production, but are higher than for most wood-industry plants of equivalent capacity.

Water Supply and Disposal

In some locations a problem of water supply or of process water disposal may influence the decision to engage in hardboard manufacture. A more likely occurrence is that water problems will affect only the choice of a manufacturing process.

A variety of hardboard processes are available for consideration. In addition to the Masonite process and the conventional wet-continuous process, common in Sweden, there are: (1) the wet-batch process developed by the Chapman Manufacturing Company, (2) the semi-dry process developed by the Plywood Research Foundation and employed at two commercial plants, (3) the wet-form, dry-press process employed by U. S. Gypsum Company, and (4) a number of dry processes developed by individual companies. The Anderson-Lighthall process, although essentially a wet-continuous process, differs from others in that the bark is included with the wood.

Water requirements for a dry process may be as low as 300-400 gallons per ton of board produced, since water is required only for steam and much of this may be returned to the boilers as condensate. Water requirements in the wet process may be from 20 to 30 times greater since an average of 10,000 gallons of water is needed to form each ton of board.

In certain areas the disposal of process water may be a more serious problem than water supply. Here, again, the dry or semi-dry processes offer an advantage.

At this stage of manufacturing development, the organizer of a new venture would do well to consider licensing under an established process. A new plant could profit from the experience of the established firm and reduce the time required to gain market acceptance of the product. Many of the established processes are available for licensing.

This discussion might be termed a preliminary consideration of hardboard manufacturing possibilities in the Rocky Mountain region, for only a few major factors have been considered. Marra[3] has outlined a general approach to the problem of deciding for or against a new hardboard enterprise, and anyone interested in hardboard production should review his more detailed analysis.

The potential market for hardboard is the key factor and the one most difficult to analyze. One encouraging aspect of the problem is that present producers are of the type that will bend every effort to expand markets by further product development and sound promotion. Continued growth of the hardboard industry will be welcomed by those interested in improved wood utilization.

[3]Marra, G. G. Problems in the conversion of residual wood to hardboard. Presented to Wood Industries Division, A.S.M.E. Available from Washington State Inst. of Tech., Pullman. 1952.

Maintaining an Effective Organization to Control the Occasional Large Fire[1]

M. H. Davis
Assistant regional forester, Southwestern Region, U. S. Forest Service
Albuquerque, New Mexico.

THOSE OF US who have been exposed to fire protection through the years are well aware of the hazards of gambling with preparedness to handle fires quickly and effectively, when they occur. Fire is no respector of precedent — geographically, topographically, nor with respect to day of the week or month of the year. If there is a theme to this paper it consists of one word *preparedness*.

Small fires normally can be handled effectively by one or a few men equipped with shovels, axes, backpumps, and the basic tools. The fire which makes for trouble, however, is the one which finds us unprepared.

An effective organization for any program is competent and prepared for action. The objective, here, is to define preparedness for the forester, landowner, or fire boss responsible for handling the occasional large fire.

How can we assure preparedness? First of all it is essential to assume certain controlling facts, i.e.,:

1. The area involved constitutes a potentially hazardous fire area at intervals.

2. The area is under protective control of a designated individual, organization, or agency.

3. The facilities essential to fire suppression are available and authority is vested to take action.

4. Financial responsibility for suppression costs is fixed.

The party or agency responsible for action had better determine a date—appropriate to the area concerned, and with due regard to fire burning periods — by which time the fire "team" is ready to go. Recurrent, annual, thorough analysis of factors is imperative to the maintenance of an effective fire organization. There is no substitute for this essential.

[1]Presented at the annual meeting, Society of American Foresters, Colorado Springs, Colo., September 1953.

Fire Organization

What are the factors? They include:

1. *Man-power.*—Top to bottom—"general" to "buck" private. Are they available and ready to go?

2. *Weapons.*—An army without guns and ammunition is hardly an effective force. Let's not fight fire with antiquated equipment. Development, testing, and adoption of modern fire-fighting equipment is one of the best assurances of an effective suppression job.

3. *Transportation.*—The "army" and the "weapons" won't do any good if you can't put them on the fire in time.

4. *Food and supplies.*—Don't ever try to fight a fire on an empty stomach.

5. *Communication.* — Have you been in the back-country—50 miles or so—and in urgent need for reinforcements, a doctor, aerial reconnaissance, or just plain "contact" when your radio or telephone facilities failed?

6. *Information.*—Call it intelligence, scouting, reconnaissance, or what you will. A fire boss on a big fire is lost unless this information is reliable, current, and complete. Let's be sure to give high priority to fire weather forecasts and interpretation in terms of fire behavior.

7. *Dispatching.* — I have never forgotten an experience during my early years as a dispatcher in southern California. A modest fire of several hundred acres was burning in the back country and the ranger was on the job. I heard not a word from him on the fire itself for three days, from the time he left his station. Finally, he reported: "Fire under control—see you soon." When he came out to civilization I asked why he hadn't kept us informed. He replied "I knew what you would do, and you did it—much obliged." He was referring to the fact that the "sinews of war", men, supplies, equipment, etc., were forthcoming. What he failed to recognize was that the job had to be done the hard way.

The moral to this story is that dispatching should be recognized as a vital factor in the fire suppression job. To be most effective it requires team work, i.e., by the dispatcher and by the fire boss, or his designated contact, with the dispatcher.

8. *Liaison.* — Sightseeing traffic in the vicinity of a fire can be a real problem. Two years ago it was necessary to secure a CAA ban on unauthorized airplane traffic in southern New Mexico, due to smoke-caused poor visibility conditions in the vicinity of the fire suppression operating area. With four aircraft working dawn to dusk dropping equipment and supplies over a 40,000-acre area, danger to life and aircraft was very real. How about public relations—the press, radio, police, and persons "in-the-path" and the near-by property owner who wants to back-fire to save his property — also, the logging companies and the military? These all are liaison jobs.

9. *Safety.*—Last, but perhaps of greatest import, is the safety of the men on the job. Too many tragic examples of injury and death exist to permit secondary consideration of this item.

The foregoing factors are merely elements of the job. What about on-the-line organization, over-all strategy, and tactics on the job? I suspect that the big fires become bigger because of one of the following reasons:

1. Poor generalship — strategy, leadership, organizational ability—or let's call it competeney.

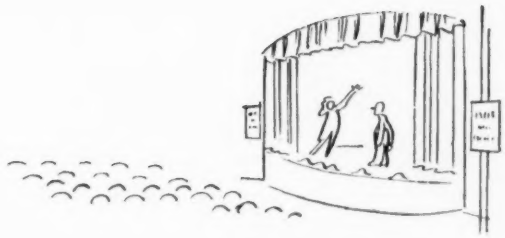
2. Failure in tactical operations.

3. Failure in organization—too little, too late, or inefficiently utilized?

4. Failure in logistics—dispatching, transportation, or equipment.

5. Failure in training or preparedness.

I have not listed the above in priority order. However, I am confident that you will agree that fail-



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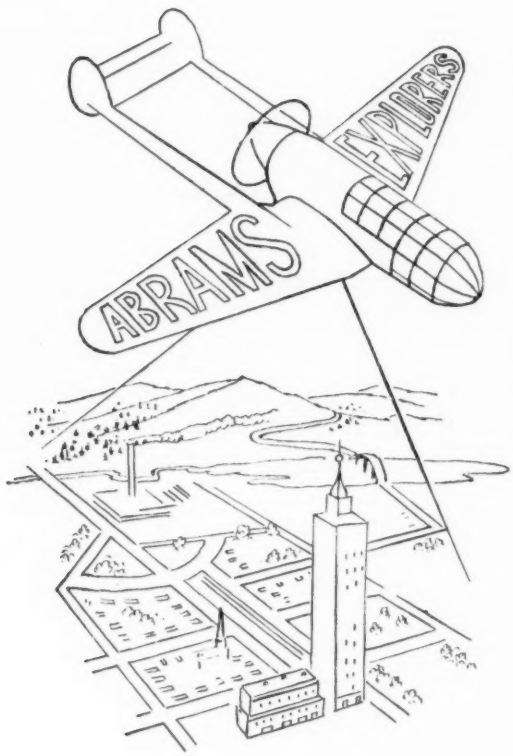

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ure in any one or more of these factors or elements can, and all too frequently does, result in the "blow-up" of a fire situation. The elements to remember are:

The Boss

Organization
Strategy
Tactics
} Direct on the line use of the "sinews of war"

The "Sinews"

Manpower
"Weapons"—equipment, tools.
Transportation
Food and supplies
Communication
Information
Dispatching
Liaison
Safety

Fighting a large fire is a big job. It is complex. It is a science involving a knowledge of fire behavior, the elements, organization, psychology of relationship, the integration and direction of a complex organization of specialized effort and the well-being and safety of people.

An effective organization must be maintained to handle efficiently any large fire. The most competent man available should be placed in command of the fire suppression job. This is a fundamental essential.

In directing on-the-line use of the "sinews of war" this man must base his decisions, involving organizations, strategy, and tactics, upon factual information acquired personally or for him by delegated assignment. We are familiar with most of these factors—topography, cover, slope, fire location, etc. I want to place emphasis on another item of great importance which too often is passed over lightly, i.e. fire weather forecasts and interpretation.

Wide variation exists in availability and use of fire weather forecasts. For example, California utilizes mobile fire weather forecasting units and secures on-the-ground factual data and forecasts. These data can be scientifically applied to fire behavior patterns and used in determining strategy and organization.

Arizona and New Mexico, however, are dependent upon generalized weather forecasts which lack sufficient localized data upon which to evaluate fire conditions, as in the case of California. Emphasis on adequate fire weather forecasts and adequate interpretation and their effects on fire behavior provide the fire boss with essential tools in determinating strategy and organization needs. Tactical practices likewise will be effected. Moreover, safety of men can be assured to a far greater extent by the aid of adequate fire weather forecasting and interpretation in relation to fire behavior.

Another factor of extreme importance on the project fire is the adequacy of inspection. Many fires have been "lost" because of a weak "link-in-the-chain." Had the weak link been discovered early and remedial action taken promptly

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would it have become "the big fire of that year?" Effective training, supervision, morale or team-work, and all other vital elements are wasted if the fire boss is not sure that strategy, tactics, organization, communication, etc., are being executed as planned—and successfully. The fire boss must know that there are no weak spots. On a major fire authority and responsibility must be delegated. There are competent and incompetent inspectors. Selection, training, assignment, reporting standards, and on-the-spot effectiveness are vital requirements.

The elements of the fire suppression job must be understood and listed prior to the time of need. Their application, analysis, and solution must be written and a fire plan for the area developed. This fire plan should set forth all details of organization including source of manpower. It should provide all essential data for all members of the "team"—from the fire boss on down—to know their assignment, to whom they are responsible, and specifically what their duties will be on the fire. The experience and background of all key members of the organization should be listed and training needs set forth.

A word about the tenure of employment for key men—effectiveness of fire suppression is hampered too often by failure to retain experienced, trained, and competent men. Security of employment is a prerequisite to retention. Smokechasers, crew leaders, and technicians acquire competency only through continued training and experience. Such men should receive full consideration in assignment to other work.

A training program for all key personnel should be prepared and revised annually.

This program should detail each year (a) objectives, (b) methods, (c) time and place, and (d) participants. Safety for men in fire suppression should not be ignored. Instructors should be assigned sufficiently in advance to assure adequate preparation and, if possible, advance review of training by the instructors with the training officer should be arranged. Instruction should cover, in addition to basic elements, the following: (1) escape routes for emergency "exit"; (2) lookouts for safety warning in cases where danger may exist; (3) avoidance of critical spots during inactive or rest periods; (4) routes of travel into the assigned position and also emergency exit from the assigned position; (5) safety precautions involving use of tools. The factor of safety is a must in suppression tactics. The leader, foreman, sector, division or fire bosses, machine operators, and specialists must be personally competent and assume responsibility and authority to prevent accidents.

An excellent training device is to detail trainees to going fires on a programmed, planned basis. This was done in 1951 in southern New Mexico where a group of trainees from three regions were pooled under assignment to the regional training officer. Training consisted of orientation and job assignment. Orientation included briefing on a 40,000-acre fire including organization, strategy, tactics, aerial operations (smokejumpers, supplies), safety, inspection, etc. Assignment was subsequently made to specific line or staff jobs in accordance with needs of the trainees. As apprentices, the trainees were detailed to instructors. As opportunity afforded and progress warranted final assignment was made. Results of this program for the 64 trainees were most encouraging.

It is recommended that a review be made of each year's fire record and fire suppression accomplishment, to determine strong and weak spots in the program. There should be also an annual fire report of the year's effort. Such a report will show trends, accomplishments, problems, and other data essential to complete understanding of the fire protection situation, for the area concerned.

As professional foresters we should not accept any standard short of professional adequacy for any phase of our professional activities. This is particularly significant with respect to fire suppres-

sion. As an aid to fire suppression preparedness the following check list is presented.

1. What is the fire history for the area?

2. What is the fire record for the past five years?

3. What are the necessary equipment requirements?

4. Is the fire plan for the ensuing year adequate and up-to-date? Does it cover current hazard and risk?

5. Is the fire boss competent?

6. Does the fire plan provide adequately for the elements outlined above? A—1 to 3 (the boss) and B—1 to 9 (the sinews)?

7. Have training plans been prepared for the current year and instructors and trainees assigned?

8. Have the "Board of Directors" for the area been briefed adequately as to financial requirements to maintain a competent "ready" suppression force?

9. Can the fire boss put his *X* and initials on a statement to his "Board of Directors" that "We are prepared?"

Two final important items often overlooked are morale and physical readiness. Morale is a potent force. It consists of far more than pay, housing, food and the 1-3's of employment. Good leadership is essential to effective fire suppression. Can the fire boss pass this test? Physical condition of a fire crew and the key men in the organization can be assured through proper planning and work direction. These factors should not be left to chance. So, (1) analyse, (2) define objectives, (3) plan, (4) train, (5) inspect, (6) direct, and remember safety, morale, and physical condition.

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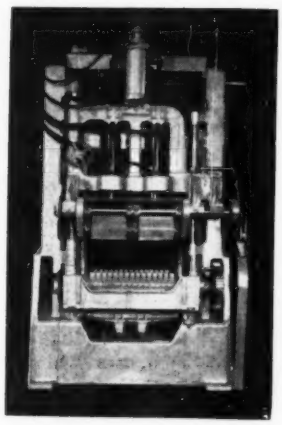

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Silvicultural Foundations for National Forest Cutting Practice in the Ponderosa Pine Stands of the Southwest[1]

James E. Egan
Staff assistant in Timber Management, Regional Office, U. S. Forest Service, Albuquerque, N. M.

WE, IN THE Southwest, are particularly fortunate in having for a guide in the management of our principal species the results of 45 years of continuous research by the Southwestern Forest and Range Experiment Station.[2] Most of these studies have been conducted at the Fort Valley Experimental Forest and nearby on the Coconino National Forest. For nearly forty years this research work was carried on under the direction of G. A. Pearson. Mr. Pearson had the unique experience among American foresters of initiating a research program, guiding its development, observing and analyzing its results, and defining a system of management based on the research findings, supplemented by his own continuous observations.

The forest management research program which Pearson initiated is a continuing one with others (first George Meagher and now Ed Gaines, with their associates) carrying the work forward and bringing new viewpoints, new research projects, and new methods of analyses to bear on the forest management problems of this forest region.

The ponderosa pine cutting practices that are now in effect in the Southwestern Region are the results of the joint efforts and consultations of the staff of the Southwestern Forest and Range Experiment Station and the foresters in charge of timber management in the Southwestern Region.

The Timber Stand

Ponderosa pine occurs in almost pure stands throughout the Southwest and is the most important species from the standpoints of abundance and quality of wood produced. The virgin stands are characterized by a high proportion of the volume in overmature yellow pine trees, by the occurrence of heavy though somewhat spotty stands of saplings and small poles, and by a general scarcity of large poles and small-diameter sawlog trees. Although about forty percent of these pine stands have been cut, the biggest job from the silvicultural standpoint is the conversion of the virgin stands to managed stands.

There are few ideally stocked acres. The local areas occupied by the groups are generally overstocked, with understocked or unoccupied areas between the groups. Most virgin areas are making some net growth, apparently as a result of an increase in stocking under protection; but losses in the overmature groups are so high that arresting mortality is the most pressing management problem in the virgin forest. In general, advance reproduction is present throughout the forested areas, though some rather large areas exist where reproduction has been excluded by grass competition or browsing of game and domestic animals.

No general description of the cut-over area is feasible. Pre-national forest cutting and private cutting prior to acquisition, left large areas of forest land understocked with generally insufficient seed sources. Some of these areas are restocking naturally; some are not. To date efforts at artificial regeneration have been generally unsuccessful and on such a small scale that they have no significance.

Early Forest Service cutting methods, the seed-tree method and selective cutting of up to 80 percent of the merchantable volume, predicated upon 60 to 100-year cutting cycles, resulted in areas which

[1] Presented at the annual meeting, Society of American Foresters, Colorado Springs, Colo., September, 1953.

[2] The Southwestern Forest and Range Experiment Station has been administratively combined with the Rocky Mountain Forest and Range Experiment Station. The research program of the Southwestern Station is continuing under Research Centers in Arizona and New Mexico.

We Want the Answers, Too!

Someone has said: "The Lord provides the sparrow with food, but He doesn't put it in his nest for him."

A Divine Providence has given us our forests but it is our responsibility to care for them and to make them produce in greater abundance.

To this end we have accelerated our program of forest research. We want to know how to obtain the maximum amount of forest products from our woodlands, increase quality, and more successfully combat fire, insect infestation and disease.

Too, we seek the answers to other questions that now challenge geneticists and silviculturists, and when we find them we will be glad to share this new knowledge with our land-owner neighbors, many of whom sell us pulpwood and all of whom are growing "more trees for tomorrow."

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are deficient in growing stock. The redistribution of size classes to permit regular cuts at short intervals will take a long time in these areas.

Following the era of heavy cutting and low reserve volumes, a modified form of maturity selection cutting based on the Keen tree classification was employed. This method resulted in leaving reserves of 40 to 50 percent of the original stand volume. The method did not produce the best effects since it resulted in the removal of many trees capable of producing high-quality wood and the leaving of long-crowned and, therefore, low-quality, wolf-type trees. It was abandoned in 1946[3] in favor of the "improvement selection" system developed by Pearson at the Fort Valley Experimental Forest.

[3]Pearson, G. A., Management of ponderosa pine in the Southwest. Agriculture Monograph No. 6, U. S. Dept. Agric., Forest Service, 1950. P. 58.

Physical Environment and Silvicultural Characteristics

The best stands of ponderosa pine occur on deep, well-drained soils, but the species will tolerate a wide variety of soil conditions and the soils throughout the Southwest will generally support commercial pine stands. The character of the soil does, however, have an important bearing on the establishment of reproduction.

Solar energy is plentiful. In spite of this, temperature is a limiting factor. Low temperatures throughout the pine zone in the Southwest result in a short growing season which limits growth. Rainfall, however, must be considered the all-important limiting factor, since there are millions of acres in this region where temperatures and soils are satisfactory for timber growth but moisture is insufficient to support commercial forest stands. As Pearson points out,[4] "Competition for the limited moisture supply dominates the whole ecological picture."

A number of facts with regard to ponderosa pine in the Southwest, established by the Southwestern Forest and Range Experiment Station,[5] are helpful in evaluating the problems of its silviculture.

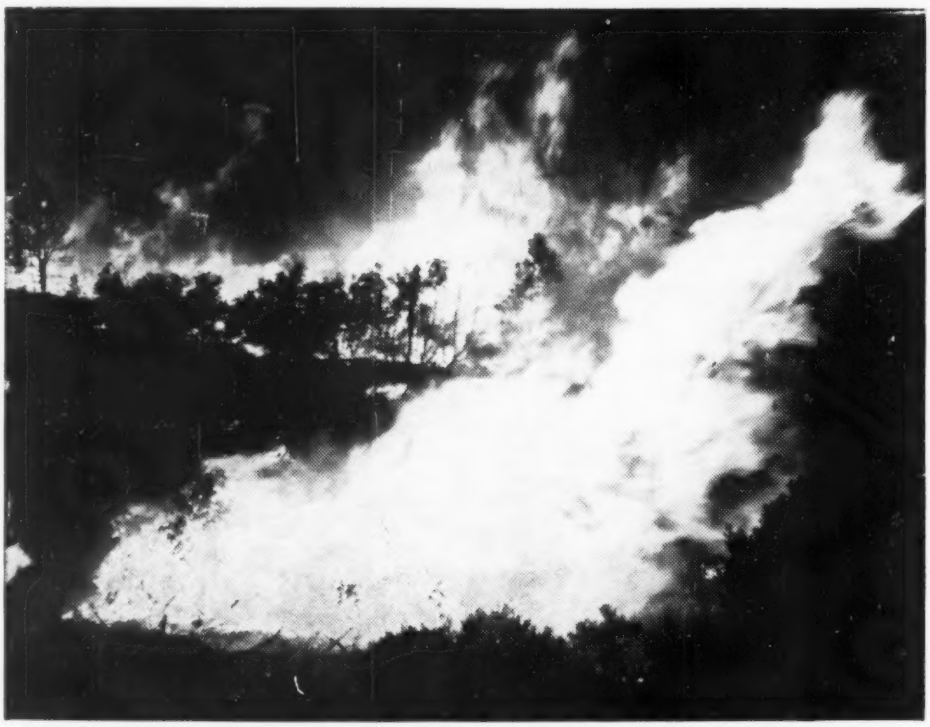
1. Southwestern ponderosa pine occurs typically in even-aged groups, but, for management purposes a single age-class group will frequently contain tree sizes equivalent to a many-aged group. Size distribution is frequently equivalent to a many-aged stand with an age span of more than 150 years.

2. Response of ponderosa pine to release (primarily from competition for moisture) is universal, up to an age of 200 years or more.

3. Large crowns are of little significance in maintaining or stimu-

[4]Pearson, *op. cit.*, p. 13.

[5]Pearson, *op. cit.*



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The primary job of the forest manager is to help nature grow wood. The above picture shows a rich new crop of young trees springing up around mature seed trees. When International Paper Company forest managers harvested this area five years ago these carefully selected seed trees were left standing to serve as parents for a new generation. Nature, given a helping hand, is an incomparable tree planter.

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THE PENOBSCOT CHEMICAL FIBRE COMPANY, manufacturer of high-grade sulphite and soda pulp, has through its procurement and timberland subsidiaries developed a modern management plan for the 600,000 acres of Maine timberlands which it owns and operates.

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PENOBSCOT CHEMICAL FIBRE COMPANY

GREAT WORKS, MAINE

lating growth rate since a small leaf surface will handle all the photosynthetic activity that the water supply can support.

4. Pine seedlings will, over a period of years, establish themselves in small openings in sufficient numbers for restocking after partial cutting provided they are given adequate protection.

5. Net growth after cutting normally increases during the first 5-year period following cutting, reaches its peak during the second 5-year period, and declines in the third and subsequent periods. Therefore, short cutting cycles of 20 years, or even shorter duration, are desirable.

6. Side shade is generally beneficial and top shade generally detrimental to the production of quality timber. (Contrary to experience in other regions, even the densest stands seldom stagnate in the Southwest.)

7. Thinnings can be effectively used to increase growth on crop trees and thereby shorten the rotation.[6]

8. With frequent selection cuts, losses from lightning, insects, blister rust, red hot, and mistletoe—except in extreme cases—can be held to a minimum.

9. Rough-boled "blackjacks" in groups, though growing rapidly, are often poor investments due to suppression of higher quality trees in the stand.

10. Silvicultural measures conducive to high quality can also result in high yields.

The Silvicultural Prescription

The prescription outlined below was tailored by Pearson to fit the environmental and silvicultural requirements of southwestern ponderosa pine stands. He named the system "improvement selection". Pearson says:[7] "Silviculturally and economically the primary aim of improvement selection is to build up an effective growing stock and quality is expected to rise more than volume increment. . . . An adequate growing stock must first of all contain enough well-distributed trees to make reasonably full use of the soil; and the gradation of size classes must provide for a succession of cuts at relatively short intervals." (It is important to note that Pearson refers to size-class distribution rather than age-class distribution.)

This is accomplished by:

1. Removal of declining and low-quality trees including "wolf" trees.

2. Removal of the additional trees necessary to enable the remaining trees to grow and bear seed. In yellow pine groups this entails the removal of the larger trees, generally the dominants, and leaving the smaller stems, codominants and intermediates, of short crown and relatively clear bole. In "blackjack" groups it consists largely of the removal of the rough dominants and some codominants.

3. Subsequent cuttings at intervals of 20 years or less to provide refinements in spacing, release, and the selection of superior growing stock.

The full application of the improvement selection system to southwestern virgin ponderosa pine stands normally results in the removal of 50-55 percent of the stand volume 12 inches d.b.h. and over in the first cut. Subsequent cuts would be much lighter.

While improvement selection may not provide the final answer to the silvicultural requirements of southwestern ponderosa pine, we know that it provides a good answer for our present stands, and it charts a clear course of action which is understood and accepted by the foresters in the Southwestern Region.

The Cutting Program

As mentioned previously, arresting mortality in the virgin stands is our most pressing problem. Losses now approximate 60 board feet per acre per year over more than two million acres of national forest timberlands. A salvage cut of about 15 to 20 percent of the volume of these stands would re-

[6] Gaines, Edward M. and E. S. Kotok. A Summary of thinning studies in southwestern ponderosa pine. Unpub. manuscript, Rocky Mountain Forest and Range Expt. Sta. 1953.

[7] Pearson, *op. cit.*, pp. 59-64.

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That's a fair measure of Gair's stake in the future of forestry. At Gair Woodlands Corporation in Savannah, Georgia, we manage our 320,000 acres of forest as scientifically as a modern farm, with planned programs for cutting, thinning, harvesting, reforestation and planting. Drainage and fire protection are also important parts of our operation. So are the assistance and instruction we furnish other landowners from whom Gair buys pulpwood.

Recognizing our own and the industry's increasing need for graduate foresters, we've recently awarded two four-year scholarships in the Schools of Forestry in the Universities of Florida and Georgia. And we're always on the lookout for trained foresters.

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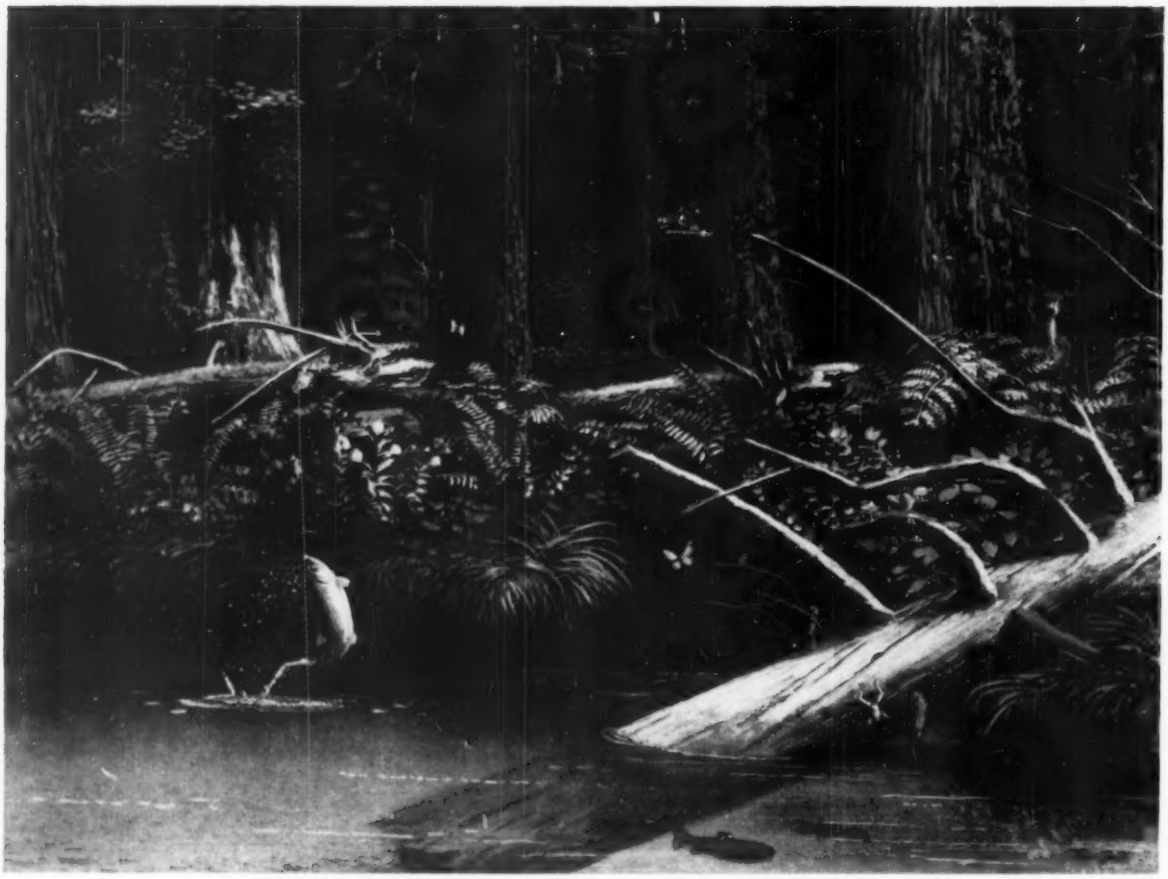

WILDLIFE in a very old forest where growth is declining and good wood is being lost by rot and decay while young trees are being suppressed. These over-ripe trees must be harvested soon to obtain maximum value from their wood and make room for a new tree crop.

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Tree farms are privately owned woodlands where timber is managed as a crop. A perpetual yield of good wood from the land requires a long-range forest management plan providing for restocking of cutover land . . . as well as protective measures to reduce wood losses from rot, fire, insects and disease. Since over-ripe trees are most susceptible to these natural forest enemies, tree farmers know they must be harvested to obtain their maximum usable wood. Such harvested lands are restored to useful production growing vigorous new tree crops for future needs.

Today, about 5,100 privately owned tree farms are operated on more than 30 million acres of tax-paying forestlands. All timberlands owned by this company are managed as tree farms. *Write us at Box A, Tacoma, Washington for free booklet,* ***Tree Farming in the Pacific Northwest.***

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duce mortality by about 80 percent and allow an interim period of 10 to 20 years in which to return with a silvicultural treatment. Increment in stands cut on this basis would not approach the maximum, in either net volume or quality, which the sites are capable of producing. But reduction in losses together with incidental release should provide a growth dividend approximating the present annual losses. Some such cutting has been done on the Coconino National Forest and was described in the JOURNAL for January 1949.[8]

Such a salvage program, though it has much to commend it, has drawbacks which render its large scale application impractical. The costs of the permanent road system needed to implement future silvicultural treatments frequently render such light cuts uneconomic. Loggers must operate at a profit and, in general, a reasonable return from stumpage to the counties and to the U. S. Treasury are economic and political necessities.

The 50 to 55 percent cut required to put most of the virgin stands in good growing condition would provide funds for road construction, the counties, and the U. S. Treasury. It would, however, under sustained yield, require a long period to get over the remaining virgin stands and too long a period would elapse before present losses from mortality could be cut down.

In cooperation with the Experiment Station a compromise solution has been evolved. The needed initial silvicultural treatment is being given in two installments. An initial cut of 30 to 40 percent of the net merchantable volume is made to provide for the economic necessities, to accomplish the needed salvage rapidly, and to provide the most urgently needed silvicultural treatment. This cut is followed in 20 years or less by a second cut which salvages trees then declining, but has as its major purpose providing release for the higher quality stems in the stand. Both of these cuts are needed to implement all of the principles of improvement selection. The marking guides, which are digested below, are the guide lines used by the foresters in the woods to assist them in carrying out the principles embodied in this silvicultural system.

The initial cut is, from the silvicultural standpoint, too light. Many stems that should be removed to promote the best in quality growth have to be left in storage on the stump for future cuts. Some of the trees that are left will not put on much volume in the next 10 or 20 years. Some of the better crop trees in the growing stock will not be provided with sufficient growing space. Some stems will be left that will not produce quality lumber, and there will still be some overstocked acres.

However, mortality will have been reduced and the harvest road system built rapidly over the tim-

[8] Egan, James A. Forestry above the Mogollon Rim. JOUR. FORESTRY 47: 14-17. 1949.

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bered area. The reserve stand will produce better quality wood. Many of the low-quality stems will have been removed. Many of the better stems will have more growing space. Many of the overstocked acres will have received some release. And the reserve stand will contain less decay and disease and be less susceptible to insect attack than the original forest.

This compromise makes possible a first cut over the remaining virgin stands within 20 years; and within 40 years or less, upon the completion of the planned second cut, the commercial timber stands of the national forests will be in reasonably productive condition. The principal exceptions will be those stands which were denuded or severely depleted before being placed under national forest administration.

Along with the harvesting program, salvage cutting is practiced wherever it is possible to market the dead and dying trees in the stand. Large acreages or volumes decimated by fire or other destructive agents are normally salvaged; but salvage of timber from small fires, from localized insect infestations, from mistletoe and paint brush blister rust infection, or from lightning strikes is more difficult to attain. Several million board feet of the timber killed by these agents are being salvaged each year and the proportion that can be economically salvaged increases yearly as the permanent logging-road system is extended through the forest.

Cutting in the light stands in pre-forest and early national forest cutting areas follows the principles of improvement selection. Removals are usually very light (300 to 500 board feet per acre), since the primary objective for some decades to come must be the building of an adequate growing stock. The problem of building up the growing stock is acute on these extensive areas of commercial forest land, where all merchantable stems were originally removed and fire was allowed to run unchecked through the slash, to the end that the forest capital was almost totally destroyed.

Regional Timber Marking Guides

These guides have been digested from regional instructions which are available to all personnel engaged in any phase of timber work. Continuous in-the-forest training and inspection are carried on to make sure that the guides are understood and followed.

In order to provide flexibility in marking so that the cut can be varied to meet the variety of conditions encountered, priorities have been established for the marking of the types of trees found in the pine stands.

Priorities for Marking Saw Logs

Priority 1. Trees likely to die before the next cut ("must" trees).—Trees severely damaged by lightning, trees heavily infected with mistletoe, trees heavily in-

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They are urged to allow a few extra days in scheduling to permit first hand inspection of the truly significant progress in industrial forestry in the past decade.

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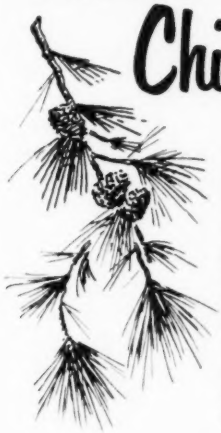

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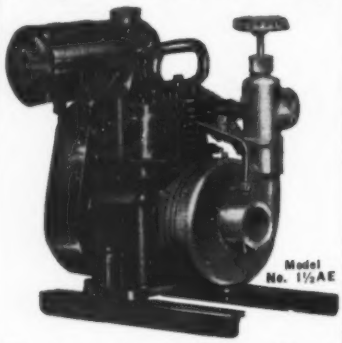

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fected with paint brush blister rust, trees attacked by bark beetles, trees with severe mechanical injuries, and other obviously declining trees.

Priority 2. Undesirable trees which would probably live but are a critical disease hazard or are not wanted or needed in the stand.—Trees with active mistletoe infection, trees with paint brush blister rust, trees in an advanced stage of decay or highly susceptible to decay, trees with mechanical defects, trees with exceptionally large spreading branches, and trees of exceptionally large size.

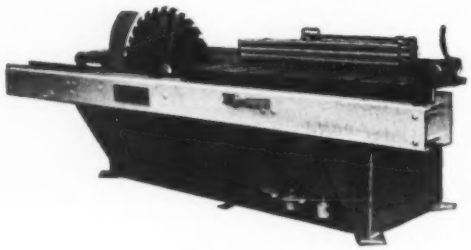
Priority 3. Trees that should be removed to improve spacing within tree groups.

Summary

The preceding paragraphs have outlined the research foundation for national forest cutting practices in ponderosa pine stands in the Southwest, the timber stand with which the Forest Service is working, the more significant environmental characteristics of the southwestern pine region, the silvicultural characteristics of southwestern ponderosa pine as established by long and continuing research, the silvicultural system developed by Pearson and his associates, the national forest timber harvesting program, and the regional timber marking guides used as an aid to getting the right kind of job done in the forest.

There are a number of problems in the management of ponderosa pine stands for which satisfactory solutions have not yet been found. The Region and the Rocky Mountain Forest and Range Experiment Station are working on these problems. Major developments and changes may come from these efforts in a number of phases of timber management. But thus far, nothing we have learned indicates a need for extensive modification of our cutting practices. We feel that over the years we have arrived at a sound silvicultural prescription.

SHORT LOG BOLTER



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Notes

Skidway Inspections Aid Bark Beetle Research

The southern pine beetle (*Dendroctonus frontalis* Zimm.) has long been considered the most destructive of the southern pine bark beetles. The insect is well known in the Deep South for its ability to build up rapidly to epidemic status under favorable conditions, and then, with equal rapidity, decline until populations are so low as almost to defy detection.

Following an epidemic in east Texas in 1950-51, efforts were made to keep the beetle under observation. By January 1952, however, it had virtually disappeared, and the rest of that year it could not be located either by examining dying pines, checking trees in the vicinity of old beetle kills, or caging material infested with other bark beetles for possible emergencies of the southern pine beetle. All reports of southern pine beetle activity were investigated, but these proved to be cases of mistaken identity. In 1953, a different approach was started which is proving to be of value in pin-pointing this insect.

Each month, logs on the skidways (log concentration yards) of a large lumber company are examined for evidence of the beetle. The logs, which are trucked in from both normal and salvage operations, include many that have been taken from insect-attacked trees. Before being hauled to the mill, the logs are stored for several weeks at the skidways. Here they are branded and dated in such a manner that they can be traced to their point of growth. Hundreds of suspect logs from many areas can be examined at a skidway in a relatively short time.

Several groups of recently infested logs have been found in such inspections. Each group is traced back to the woods, and a careful check is made for additional evidence of the southern pine beetle. Site and stand conditions on the attacked area are recorded in the hope of learning the habitat favored by the beetle at its low level of population. If such habitat can be identified and kept under observation, increases in population could be detected before infestations reach epidemic proportions.

Inspection of logs at skidways might also save time for researchers concerned with other problems. For example, areas supporting trees with certain features of growth often can be found rather quickly by first locating the desired logs on skidways. Where

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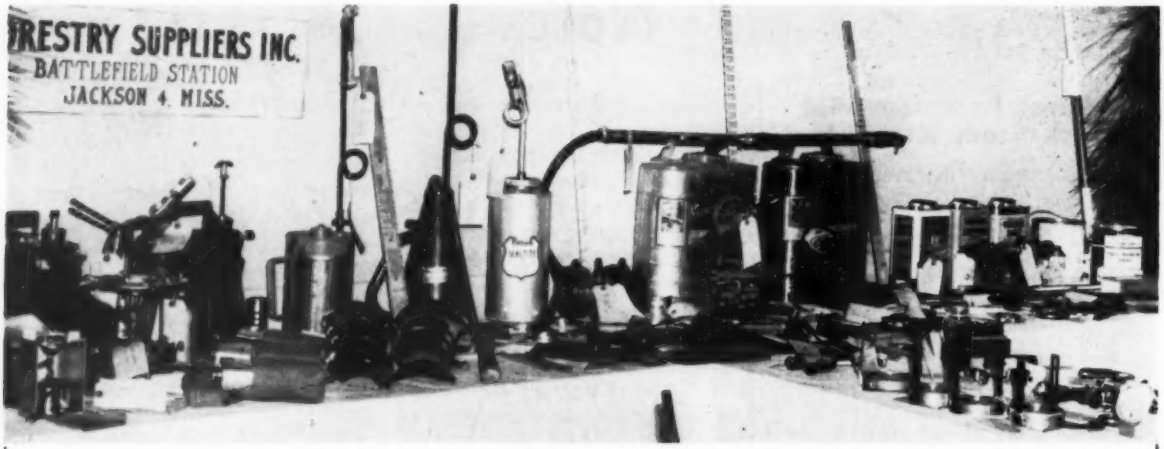

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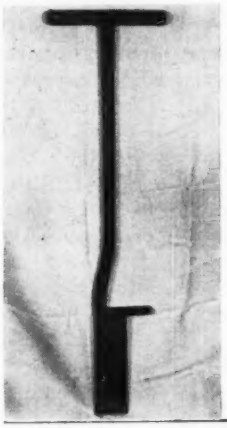

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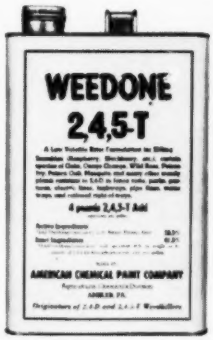

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skidways of the type described are not used, much the same results could be obtained by inspecting log decks at mills or at other points where recently cut logs are concentrated.

R. E. LEE
East Texas Research Center, Southern Forest Experiment Station, Forest Service, U. S. Dept. Agric. Nacogdoches.

How to Open Pond Pine Cones

Extracting seed from pond pine cones is difficult because the outer edges of the scales cohere. A highly effective method is to dip the cones in boiling water for a moment. Opening is accompanied by sharp, crackling noises. If the cones are removed when crackling starts, they will not become soaked and in a day or two the seed can be extracted by tumbling.

Baking, air-drying, soaking and drying, and boiling and drying were also tried in an effort to hasten opening of the cones. After each of the treatments the cones opened, but the soaking and boiling retarded complete unfolding of the scales and delayed extraction. The other 3 treatments gave almost identical results, but the quick-scalding method was the speediest.

Hand-cleaned, full seed from quick-scalded cones germinated 96.9 percent, seed from baked cones 94.4 percent, and seed from air-dried cones opened with a knife 92.7 percent.

EDWIN A. HEBB,
Southern Forest Experiment Station, New Orleans, La.

How Forest Fires Start in Tennessee

A report analyzing the causes of all forest fires in Cumberland and Morgan Counties, Tennessee, in 1953, the result of an intensive study, has been released by the Tennessee Division of Forestry, Nashville, and TVA Division of Forestry Relations, Norris.

The report describes methods used and results obtained from a thorough examination of clues on 238 fires.

Most startling discovery was that more than half (54 percent) of the owners of burned woodlands were indifferent. Some actually wanted their woodlands burned; others did not care one way or another. Another discovery was that nonlandowning willful incendiarists caused only 9 percent of the fires instead of the nearly 60 percent formerly attributed to them in this area. Fires in the two counties were found to be almost totally the result of indifference and carelessness.

Debris burners caused 35 percent of all fires. Sportsmen were responsible for 29 percent; incendiarists, 9 percent; smokers, 9 percent; miscellaneous, 7 percent; lumbering, 6 percent; railroads, 5 percent; and lightning, 1 percent.

Fires were set for such diverse reasons as cleaning fields and gardens, to "green up" pasture, to cover up a still, to obtain timber cutting rights, for warming fires, and to kill snakes. All accomplished more than their original purpose when allowed to run free through the woods.

State Forester Carl I. Peterson stated that results of the project will receive continuing study in planning a more effective fire prevention program.

Kenneth J. Siegworth, TVA Forest Development Branch Chief, indicated the techniques used in determining fire cause may also find application in other Valley states where similar problems exist.

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FISCAL YEAR MEMBERSHIP CAMPAIGN SCHOOL BOX SCORE

School	Student applications received: October listing	Total fiscal year
Alabama Polytechnic Institute	0	7
University of California	0	21
Colorado A & M College	0	17
Duke University	0	12
University of Florida	0	16
University of Georgia	0	38
University of Idaho	0	29
Iowa State College	0	26
Louisiana State University	0	14
University of Maine	0	16
University of Massachusetts	0	16
Michigan State College	0	25
University of Michigan	0	22
University of Minnesota	1	21
University of Missouri	0	20
Montana State University	0	19
State University of New York	0	23
North Carolina State College	0	19
Oregon State College	0	17
Pennsylvania State University	0	33
Purdue University	0	19
Utah State Agricultural College	0	8
University of Washington	0	28
West Virginia University	0	16
Yale University	0	3
Totals	1	485

FISCAL YEAR MEMBERSHIP CAMPAIGN SECTION BOX SCORE

Section	Proposed 1954 quota	Applications received[1]: October listing	Total fiscal year
Allegheny	100	0	62
Appalachian	100	1	46
Central Rocky Mountain	45	0	25
Central States	110	0	79
Columbia River	140	2	54
Gulf States	105	1	54
Inland Empire	30	0	38
Intermountain	30	1	14
Kentucky-Tennessee	30	0	5
New England	95	0	54
New York	65	0	39
Northern California	120	0	34
Northern Rocky Mountain	30	0	35
Ozark	55	0	47
Puget Sound	80	0	60
Southeastern	145	3	123
Southern California	20	0	2
Southwestern	35	0	7
Upper-Mississippi Valley	60	2	56
Washington	45	0	7
Wisconsin-Michigan	60	0	6
Totals	1,500	10	847

[1]Student, Junior, Affiliate, Associate (initial) grades only

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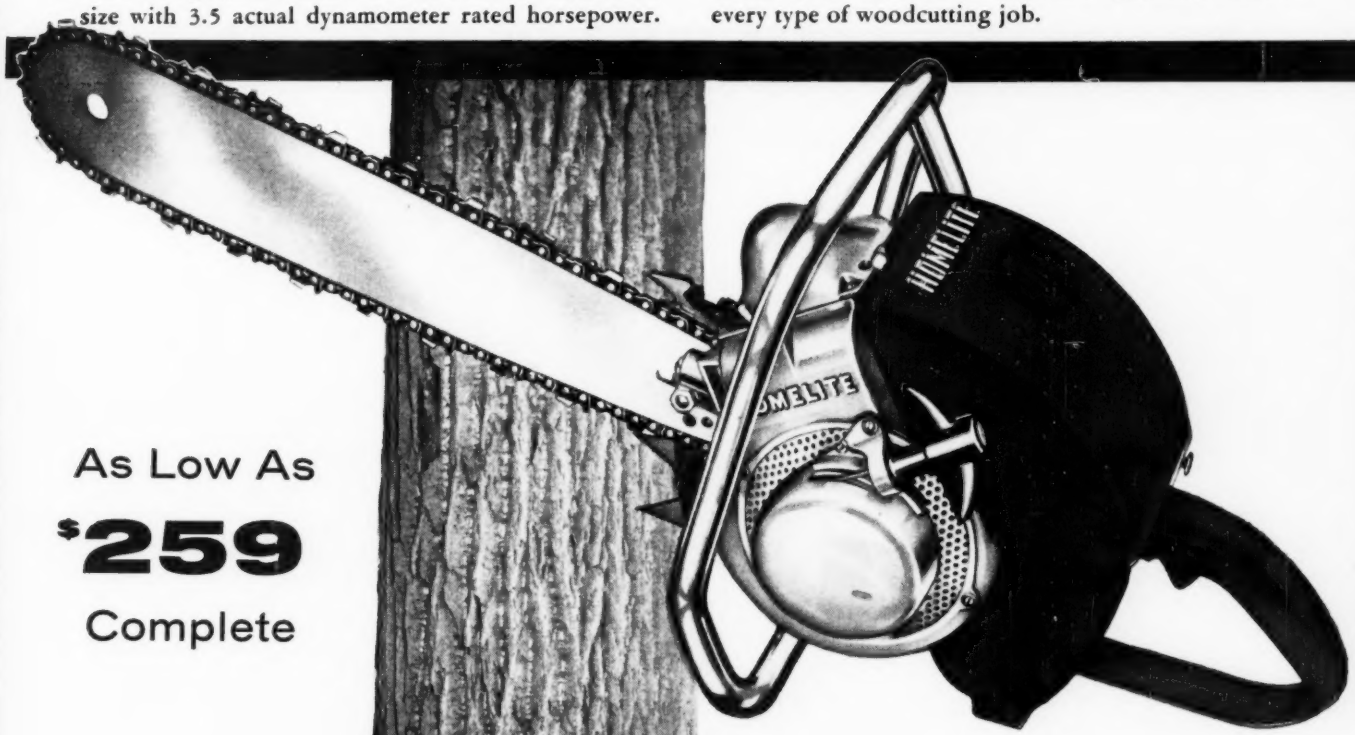

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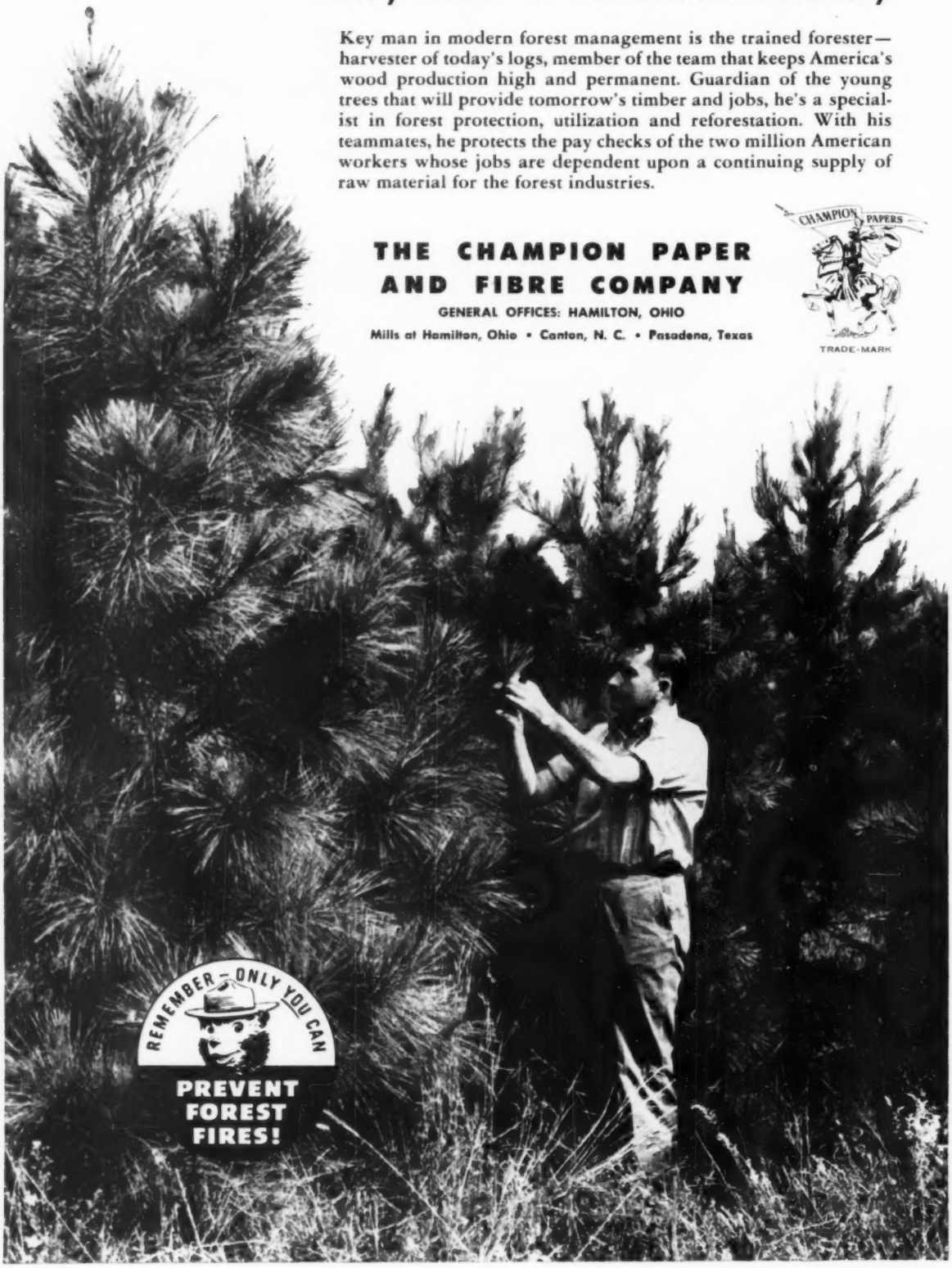

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Coming Events

Society of American Foresters

Annual meeting, Hotel Schroeder, Milwaukee 3, Wis., October 24-27.

National Watershed Congress

Statler Hotel, Washington, D. C., December 6-7.

Western Forestry and Conservation Association

The 45th Western Forestry Conference and the annual meeting of the Western Forestry and Conservation Association will be held at the Fairmont Hotel in San Francisco, December 7-10.

Fourth World Forestry Congress

Sponsored by United Nations Food and Agriculture Organization. New Delhi, India, December 4-17.

Reviews

Trees of Indiana

By Charles C. Deam, with assistance of Thomas Edward Shaw. 330 pp. Illus. Ind. Dept. Conserv., Div. Forestry, Indianapolis, Ind. 1953. (No price.)

This thoroughly revised edition of a well-known and much admired book at once takes its place among a handful of truly outstanding state tree manuals. Dr. Deam, who died in 1953 in his 88th year, was appointed state forester of Indiana in 1909, served until 1913, and was again state forester during 1919-1928. He was widely known and admired, not only as a conservationist, forester, and botanist, but as a fine human being. Among his publications his *Flora of Indiana* is considered by many as the finest floral manual of a state yet issued. Dr. Deam (because of his advanced years) consented to prepare the new edition of *Trees of Indiana* if assistance were provided, and the selection of Prof. T. E. Shaw of Purdue University was most fortunate.

A botanically arranged list of Indiana trees is given, each cross-referenced to its plate, map, and page. This list contains 158 names of native and 20 names of introduced species, varieties, forms and hybrids. The botanical descriptions and measurements are all drawn from Indiana specimens. The 8th edition of Gray's *Manual* is used as the standard for botanical names

Growing Trees for Future Generations

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In their fight to protect the woods from tree-killing insects and disease, forest owners each year spend millions of dollars in spraying infested timberlands. Some tree-killing insects, such as bark beetles, cannot be controlled by spraying. To combat these bugs, infested and threatened trees must be taken out of the woods. The best way to combat many tree-killing insects and diseases is to harvest trees at maturity. Over-ripe trees are poor risks. On industrial Tree Farms the aim is to harvest trees when they are ripe.

But Forest Fires Are Still a Major Problem

Forest industries and tax-supported agencies spend millions of dollars protecting the woods from fire. Much of this great expense could be saved if the general public would exercise greater care with fire in or near the woods. You can help keep America Green!

How You Can Help

Use Your Ash Tray

Drown Your Campfire

Burn Brush Carefully

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Bellingham, Washington Tree Farmers

and for most of the vernacular names. In a letter to Henry Clepper, Prof. Shaw remarks: "The manuscript was placed in the hands of the State government in 1952, long before Little's new *Check List* appeared. Its publication was delayed . . . Mr. Deam died in early 1953 before the book came from press. I did not see the book until early 1954 when three copies were sent to me in Beirut."

This adoption of the late Prof. Fernald's nomenclature involves, among other items, the suppression of the genus Malus, apples being placed in the pear genus Pyrus (Malus is maintained in Little's Check List). Tree hawthorns (*Crataegus* spp.) are reduced from 34 species and 2 varieties to 4 species and 1 variety. In view of Prof. Fernald's frequent caustic references to *Standardized Plant Names* it seems fair to state that his English plant nomenclature, as reflected in this new Indiana tree book, shows considerable (doubtless unconscious) influence of the compounding principles of *Standardized Plant Names*, especially when one compares the 1908 and 1950 editions of Gray's *Manual*, of which Prof. Fernald was, respectively, joint-author and author. *Trees of Indiana*, however, in some cases goes a step farther than Fernald (in Gray) toward reconciling its usage with that of *SPN* and of the U. S. Forest Service.

For example, coffeetree, honeylocust and hophornbeam are written solid, rather than hyphened; Osage-orange is hyphened instead of written as two words. Unfortunately, however, horsechestnut (which, of course, is not a chestnut) is written as two words instead of hyphened as Fernald has it in Gray's *Manual*. Incidentally, hophornbeam, Osage-orange, and honeylocust were all written as two words in the 1908 edition of Gray's *Manual*.

The family key is adapted from the new Gray's *Manual*; the generic and specific keys are original and based primarily on characters observable in the field. The bulk of the book is the detailed treatment of Indiana trees. There follow a table of measurements of Indiana big trees, and another of specific gravities of Indiana woods prepared by Dr. Eric Stark of Purdue University.

This treatment of species is followed by four maps, showing floral areas, counties, and climatic data. The floral area map and county map have been improved over those in former editions. The two maps (from the U. S. Weather Bureau) show areas of earliest and latest frosts. The book concludes with a glossary, a page of English and metric scales, and an index.

In comparing this new book with older editions one observes that the distribution notes are more elaborate and that two new headings "Uses" and "Insects and Diseases" have been added. The format is more attractive and the paper and typography are improved. Distribution maps are included for each Indiana tree, showing each county of the state where the species occurs. There are 114 plates.

William A. Dayton.

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Wild Flowers and How to Grow Them

By Edwin F. Steffek. 192 pp. Illus. Crown Publishers, Inc., New York 16, N. Y. 1954. $3.95.

The fact that this book is sponsored by the American Nature Association and the Wild Flower Preservation Society is an indication of its worth. In a word, it is a timely and practical guide to the cultivation of wild plants in the home garden.

A long time writer and lecturer on gardening and horticulture, Dr Steffek is a recognized authority in this field. His book is well organized, and easy to read and use. Here are given instruction in where to find wild flowers, how to identify them, how to transplant them, and how to grow them.

For each species or group of related plants, there are specific data about their culture, including the optimum pH content of the soil, the best season to move them, and information on moisture, climate, protection, and propagation. Instructions are given on the culture of some 350 species.

Illustrating the volume are about one hundred plates, half of them in color. The latter are splendid, but some of the black and white pictures lack contrast in addition to being too small. There is a complete index.

Altogether this a fine, useful book, highly recommended.

HENRY CLEPPER

An Introduction to Trees

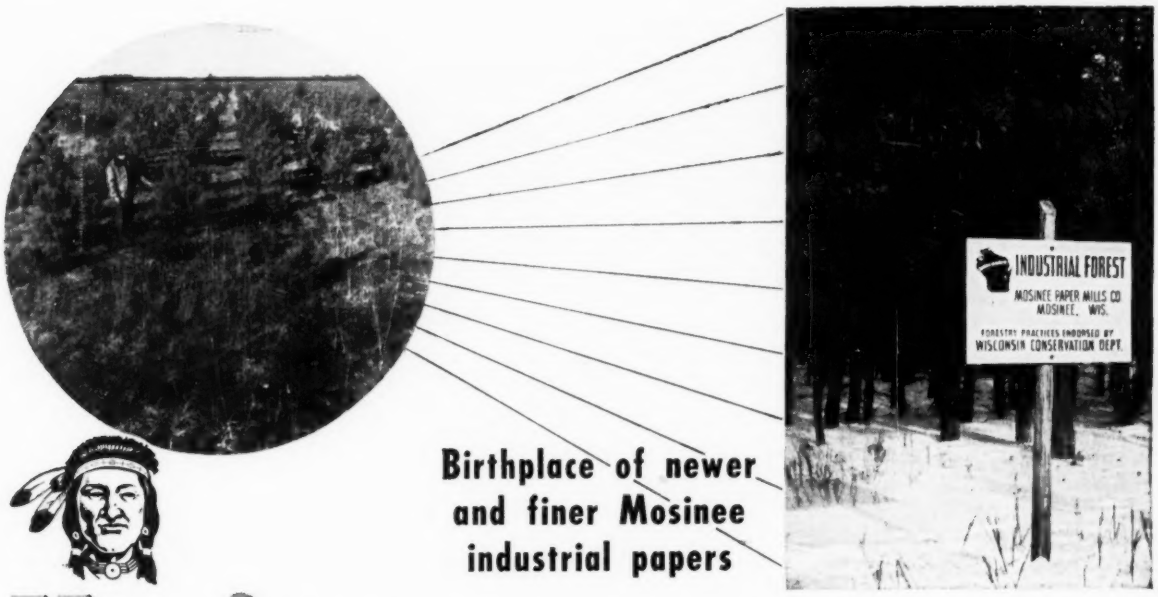
By John Kieran. 77 pp. Illus. Hanover House, New York, N. Y. 1954. $2.95.

Occasionally a book is published that is a sheer delight to look at. This is one. The format, text, and illustrations combine to make a slim elegant volume that is an asset to one's library.

Any reader of this review who seeks a book on trees for beginners will not go wrong with this handsome guide. Simply and clearly written, it introduces one hundred of the common trees of America. Each species is illustrated in colors that are truly magnificent. Seldom has this reviewer encountered a book on any subject in which artistry and good writing are as happily blended as in this work.

John Kieran, the author, well known as a nature writer of unusual gifts and the highly literate panelist of *Information Please*, needs no further identification. Michael H. Bevans, the artist, has beautifully captured the vividness of coloring in bark, leaves, flowers, and fruit. His redwood, bald cypress, and tulip tree are more than illustrations in color; they are authentic tree portraits.

In this publishing era of high costs, to find a book of such outstanding quality at such a modest price is most unusual. The forester and botanist who delights in owning books about trees should



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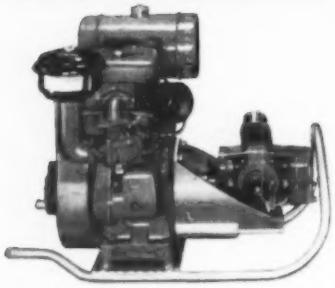

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not pass this one up because it is intended for beginners. The illustrations alone make it eminently worth buying.

HENRY CLEPPER

Forest Seed Directory, 1954

Compiled by FAO Division of Forestry. 110 pp. Food and Agriculture Organization of United Nations, Rome, Italy. 1954. (No. price)

In this unique publication, the names and addresses of seed suppliers in nearly one hundred nations and colonies are given. Although the listing of commercial dealers is admittedly incomplete, the compilation is surprisingly comprehensive.

At the request of FAO, member nations were asked to provide lists of governmental supplies and commercial seed dealers. Some countries provided lists of seed companies, but many did not. Presumably, future editions will list more commercial dealers, though this is not certain as a dealer wishing to be included in the next edition must apply through his national forestry agency and agree to provide certificates of quality and origin to buyers on request. FAO disclaims any implication that such inclusion constitutes a recommendation or guarantee of the dealer or his wares.

The method of listing is ingenious. Each country is listed alphabetically. Each supplier in each country is assigned a number. Opposite each tree species are one or more numbers which identify the suppliers and dealers. For example, under Larix are listed eight species, each with one or more key numbers. For *L. decidua* are given eleven suppliers in ten countries.

Copies are included of the certificate of quality and origin and the standard consignment form adopted by the member governments of FAO in 1951. Also included is an abstract of the International Seed Testing Association rules.

Material for the 1955 edition, including lists of commercial seed dealers, must be submitted not later than December 31, 1954 to the Forestry Division of FAO in Rome.

The Forester's Handbook

By H. L. Edlin. 395 pp. John de Graff, Inc., New York 10, N. Y. 1954. $7.

This British manual of practical forestry is written for "the man in the woods, whether he be landowner, land agent, or forester, who requires an outline of day-to-day outdoor work as now practised in Britain." As such, it is a concise and valuable summation of forestry in Great Britain. Americans can learn a good deal from it, not only about forest practices in another country, but also about aspects of silviculture applicable in our own woodlands. The book could, in fact, well serve as a model for one or more American equivalents.

H. L. Edlin is a graduate forester (Edinburgh and Oxford) who has specialized in semi-popular books dealing with British woodlands and plants. In this sixth production, his writing style is facile, to the point, and eminently readable.

Slightly more than half of the book deals with practical silviculture and most of this deals with artificial forestation, the major problem in Britain today. Though primarily concerned with native species, the author discusses such common exotics as European larch, Sitka spruce, Douglas-fir, and lodgepole pine. Of particular interest is the rabbit problem and the elaborate fencing measures necessary to bring the young planting through.

The silvicultural treatments presented deal primarily with the reclamation of poor-quality unmanaged woodlands and the care of young plantations, as these are the predominant British forest types. Americans will profit from the clear distinction made between *high pruning*, a process of "limited practical interest, for very few estates go in for it," and *brashing*, the pruning of young plantations

throughout to a height of 6 feet or more. The advantages of the latter are discussed more satisfactorily than in American texts.

In such a semi-technical treatise covering a broad field, many of the chapters are bound to be elementary, and this is true of the discussion of tree growth and structure, felling, mensuration, marketing, and protection, among others. The chapters dealing with Britain's woodland estate and with financial assistance and taxation, however, give a clear picture of the forest situation in Britain and the active subsidization program adopted by the government to improve it. All in all, *The Forester's Handbook* is a valuable practical manual for the British landowner, and a good simple summary of British forestry for the American forester.

Stephen H. Spurr,
University of Michigan.

❦ ❦ ❦

Forestry

By H. G. Champion. 230 pp. Oxford University Press, New York, N. Y. 1954. $1.

The Home University Library of Modern Knowledge (Oxford University Press), of which *Forestry* is the latest volume, is intended "to place at the disposal of students, wherever they may be, the fruits of sound learning in all the important branches of present-day knowledge." It is most appropriate that an authoritative survey of forestry should be included in this series. To the layman this subject often means little beyond the planting and harvesting of trees and the protection of the forest from fire: probably less is known by the general public of the fundamental principles and objectives of forestry than of those in any other of the major fields of applied science. This little book is aimed at improving the situation, having been written essentially for the layman who wants to know more about forestry in all its aspects. At the same time it provides for the forester a concise, up-to-date survey of his sub-

Books of Current Interest

The Flood Control Controversy

Big Dams, Little Dams, and Land Management

By **LUNA B. LEOPOLD**, *U.S. Geological Survey;* and **THOMAS MADDOCK, Jr.**, *U.S. Bureau of Reclamation*—New thought-provoking book clarifies both the technical problems and the economic and political issues in flood control. A Conservation Foundation study, it explains the hydrology of river floods and types of control measures; compares and evaluates the upstream and downstream programs of the Department of Agriculture and the Corps of Engineers. Provides a realistic basis for judging present and future programs. *"Most important book yet in flood control."*—JOURNAL of SOIL and WATER CONSERVATION *31 ills., tables; 278 pp.* **$5**

Irrigation Development and Public Water Policy

By **ROY E. HUFFMAN**, *Montana State College*—Complete analysis of the economic and social aspects of irrigated agriculture and public water policy in the U.S. Reviewing past experience, the book explains the problems to be met in planning, financing, organizing, and operating irrigation projects. Offers criteria for evaluating water resource programs, and underscores the requirements of sound, far-sighted irrigation policy on local, regional, and national levels. *"An excellent job of stating and documenting the facts."* —JOURNAL OF FORESTRY *19 ills., tables; 336 pp.* **$6.50**

Vegetation and Watershed Management

By **E. A. COLMAN**, *U.S. Forest Service*—For all concerned with our national water needs and supply, this significant book provides the first systematic appraisal of the methods of managing vegetation in watersheds to increase ground water supplies, check soil erosion and siltation, and reduce flood peaks. Describes the effect of vegetation on hydrologic processes of runoff, infiltration, storage, etc. *"A first-class contribution . . . should go a long way toward filling the present gaps in readily available information."* —JOURNAL of SOIL and WATER CONSERVATION *24 ills., 6 maps; 412 pp.* **$7**

Forest Management

By **H. ARTHUR MEYER**, *Pennsylvania State University;* **ARTHUR B. RECKNAGEL**, *St. Regis Paper Company;* and **DONALD D. STEVENSON**, *U.S. Dept. of Agriculture*—Stressing American methods of forest management plans and practices, this book thoroughly covers organization for management; problems of regulation, including determination of allowable cut; and effects of economic conditions on the possibilities and methods of management. Includes typical plans for various-sized forests. *". . . fills a long-standing need in management of uneven age stands."*—NAT WALKER, *Oklahoma A. & M. College.* *56 ills., tables* **$6**

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ject, and should prove of value to the forest administrator who may often lack technical knowledge and understanding in the field for which he is responsible.

With the exception of the last chapter, which gives a brief review of forestry in Great Britain, the book treats the subject from the general point of view, beginning with a discussion of the characteristics and functions of the tree and the structure of forests, and going on in subsequent chapters with brief accounts of the products of the forest, the history of forest clearance, forest influences, forest conservation and protection, forest development and industry, various aspects of silviculture and forest management, and with a penultimate chapter on forest policy, law, research, and education.

The main weakness or limitation in a book of this kind is the fact that the author most inevitably stop short of a full explanation of many points that may be of particular interest to the reader. This difficulty is recorded in the present volume by providing a selected bibliography, the items being listed with reference to the individual chapters.

The author of this book, who is professor of forestry at Oxford University, has had wide experience in his subject both in tropical and temperate regions. He has drawn on this experience most effectively to illustrate his text with examples of conditions and practices from many countries, often representing quite different stages in forestry development.

In introducing the layman to the science of forestry, interestingly and informatively, but with a minimum of technical detail, this book will undoubtedly fulfil the wish of its author—to bring about a wider understanding of the significance of forestry and a greater support to the forester in the work he undertakes.

J. W. B. SISAM,
University of Toronto.

Publications of Interest

Policy Declarations on Natural Resources: 1954 contains the policies adopted at the April, 1954, meeting of the Chamber of Commerce of the United States. Copies may be obtained from the Natural Resources Department of the Chamber, 1615 H St. NW, Washington 6, D.C.

* * *

Proceedings of the Wisconsin Silver Anniversary Forestry Conference, carried the record of a state-wide meeting held November 30 and December 1, 1953. This meeting marked the twenty-fifth anniversary year of the first Commercial Forestry Conference conducted in Wisconsin in 1928. Stated purpose of the meeting was "to bring together all forestry interests for a review of past accomplishments, the development of basic policies for the maximum development of Wisconsin forests during the next twenty-five years, and to focus public attention on the great present and future economic significance of forestry in the state." This official report of the conference is a compilation of the papers presented or distributed. Price $2 from the Wisconsin Forestry Advisory Committee, State Office Building, Madison.

* * *

Forestry in Minnesota—Past, Present and Future, recently issued by the School of Forestry of the University of Minnesota in connection with their 50th anniversary, provides the historical background, present activities and a look into the future of forestry in Minnesota. Forestry development at the University, in the State Division of Forestry, in the United States Forest Service, the Bureau of Indian Affairs, Minnesota Counties, and in private industry are traced from their early beginning to the present time. Plans for the future are also stressed in the publication.

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Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

Education for Forestry in the South. Southern Regional Education Board, 830 W. Peachtree St., N. W., Atlanta, Ga.

Forestry Theses Accepted by Colleges and Universities in the United States 1900-1952. Comp. by K. W. Hughes. Subject Index by R. A. Yoder and W. I. West. 140 pp. Oregon State College, Corvallis. 1953. Bibliographic Series No. 3.

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Ecology of the Sierra Nevada Gooseberry

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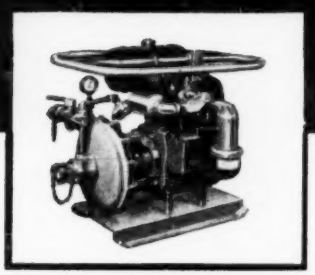

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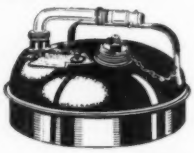

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The President's Column

E. L. DEMMON

This is the month of our annual meeting, October 24-27, in Milwaukee, Wis. Let me urge that as many members as possible attend. It is the one occasion during the year when members and their friends from all over this country and Canada can meet to discuss mutual problems, hear reports on the status of their Society, and fraternize with their fellow technicians.

The theme of this year's meeting is "Our Changing Forests." As is customary, the major part of the program will feature the forests of the region where the meeting is being held, this year featuring the forests of the Lake and Central States region.

Although members from this area can be expected to predominate in the attendance figures—we are anticipating a registration of around 1,000—this meeting offers to those who come from other parts of the country an opportunity to get up-to-date on the forestry situation and the changes that are taking place in one of the nation's important forest regions. Many will also take advantage of the opportunity to get into the woods as this is a delightful month for field trips.

This area holds a strong personal appeal for me, as I am a native of Indiana, obtained all of my schooling in Michigan, and spent a considerable part of my professional life with the Lake States Forest Experiment Station, which includes in its territory the three Lake States of Minnesota, Wisconsin, and Michigan. So to me it will be like coming home after an absence of several years. Incidentally, it will be the 16th annual meeting of the Society that it has been my good fortune to attend.

The Lake and Central States forests are of great importance to the national economy. They help serve the forest products and recreational needs of a great portion of the nation's population. Although tree growth is not as rapid as in parts of the West and South, these forests are close to the nation's industrial center and near its principal markets. The products of these forests find a ready outlet right at their back door.

In days gone by, these Lake and Central States forests bore some of the finest hardwood and softwood timber stands to be found anywhere in the country. Much of the central hardwood area of the region has been cleared for farms, but a quarter of the land remains in timber. The northern Lake States forests, covering nearly half of its land area, have probably suffered more from the ravages of fire and overcutting than any forests anywhere. So the story of rehabilitation and present use under the theme, "Our Changing Forests," should prove interesting to every forester who is able to attend this meeting.

In recent years the Society has gone a long way in encouraging local groups or chapters, making it possible for a larger proportion of members to get together at frequent intervals and participate actively in professional matters, becoming better acquainted with each other's problems. This is a fine thing, and I hope there will be even more localizing of our organization—to the benefit of the profession and the public welfare. But we need one big meeting annually, at the national level, and this year's meeting promises to be the best yet. Foresters and friends of forestry, whether members or not, are cordially invited. Ladies are especially welcome.

See you in Milwaukee!

E. L. Demmon

THE SOIL CONSERVATION SOCIETY OF AMERICA will hold its ninth annual meeting at the George Washington Hotel, Jacksonville, Fla. November 15-17.

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Clarence W. Griffith (1885-1954)

Clarence W. Griffith, a forester well known throughout the South and a Member of the Society of American Foresters, died at his home in Monroe, La., July 14, 1954.

Born in Avon, N. Y. in 1885, he was graduated from the Biltmore Forest School in 1905 with the degree of forest engineer. His work since then covered many fields; he was a consulting forester in Memphis, Tenn. until 1922, was a valuation engineer with the Bureau of Internal Revenue, Washington, D. C. for a year, and was in private practice again in Memphis until 1928 when he went with the James D. Lacey Company as manager of the Memphis branch.

He was a C.C.C. camp superintendent in Indiana for three years, then supervised the logging and milling of a large tract of timber at Henderson, Ky. for the Lacey Company from 1936 to 1943. During the latter year he moved to Monroe, La. to be in charge of the Tensas Delta Land Company, an affiliate of the Lacey Company.

T. C. Spaulding (1885-1954)

Thomas C. Spaulding of Missoula, Mont., died August 6.

Born in Richmond, Va., July 16, 1885, he received the B. S. degree from the Montana State University in 1906, and the M. S. F. degree from the University of Michigan in 1909.

Entering the U. S. Forest Service, he rose to the position of supervisor, resigning in 1915 to become professor of forestry at Montana State University. He was appointed dean of the School of Forestry in 1923, which position he held until 1945, thereafter continuing to serve on the faculty.

Closing Date for Consulting Foresters Directory

November 1 is the final date on which listings will be accepted for the Consulting Foresters Directory to be published in the January 1955 JOURNAL OF FORESTRY. Consultants previously listed who have not returned inquiry cards mailed in September, should do so at once. Others applying for listing should provide information following the form used in the Directory as published in the January 1954 JOURNAL.

The November issue of the JOURNAL will carry a symposium on the control of rodents in connection with the direct seeding of forest and range lands.

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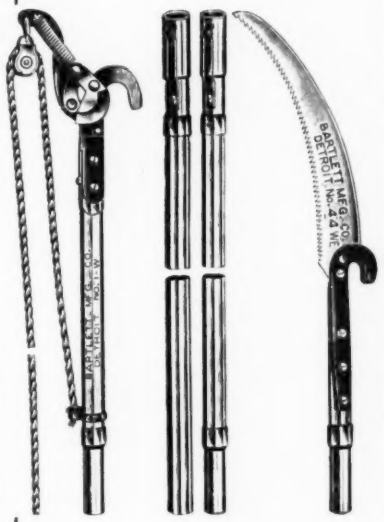

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Society of American Foresters

Milwaukee, Wis., October 24-27, 1954

Theme: "Our Changing Forests"

Schedule of Events

Members, their ladies, and guests who plan to attend the meeting are urgently requested to arrive in Milwaukee on Sunday, October 24, or not later than the morning of Monday, October 25. The opening general session starts on Monday morning.

As will be seen from the following schedule of events, numerous meetings and sessions have been arranged to provide attractions for a diversity of interests.

Sunday, October 24

S.A.F. Council, morning and afternoon meeting.

JOURNAL OF FORESTRY Editorial Board, evening conference.

Committee on Accrediting, afternoon and evening conference.

Joint meeting of Council and Section delegates, evening.

Council of State Forestry Association Executives, afternoon and evening.

Association of Consulting Foresters, evening.

Monday, October 25

General meeting, morning.

Society Affairs session, afternoon.

Division of Education, evening.

Division of Public Relations, evening.

Division of Watershed Management, evening.

Tuesday, October 26

Division of Forest Products, morning.

Division of Forest Recreation, morning.

Division of Silviculture, morning and afternoon.

Division of Private Forestry, afternoon.

Division of Forest-Wildlife Management, afternoon.

Social evening and college alumni get-togethers, evening.

Wednesday, October 27

Division of Economics and Policy and Division of Education, joint meeting, morning.

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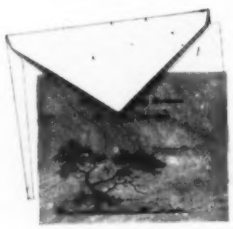

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Division of Forest Management, morning and afternoon.

Division of Range Management, afternoon.

S.A.F. Social Hour and Dinner, evening.

General Meeting

Monday, October 25

Jay H. Price, Chairman

Morning Session

Theme: "Our Changing Forests."

1. Introduction by the Chairman.
2. "The Forests of the Central and Lake States Region." M. B. Dickerman, Lake States Forest Experiment Station, St. Paul, Minn.
3. "Problems and Potentials of the Fiber Industry."

"The Northern Forests." D. Clark Everest, Marathon Corporation, Rothschild, Wis.

"A Look Across the Border." J. F. Sharpe, Department of Lands and Forests, Toronto, Ont., Canada.

4. "Utilization of Central Hardwoods." Burton F. Swain, National Veneer and Lumber Company, Seymour, Ind.
5. "Management of Our Changing Forests."

"The Northern Forests." J. B. Millar, Kimberly-Clark Corporation, Neenah, Wis.

"The Central Hardwoods." R. H. Westveld, Department of Forestry, University of Missouri, Columbia, Mo.

Society Affairs

Monday, October 25

E. L. Demmon, President

DeWitt Nelson, Vice President

Afternoon Session

1. Report of the President, E. L. Demmon.
2. Report of the Executive Secretary, Henry Clepper.
3. Report of the Editor, Arthur B. Meyer.
4. "The Society's Forestry Research Project." Frank H. Kaufert, Director.
5. Committee Reports.

Open forum discussion.

Division of Education

Monday, October 25

Kenneth P. Davis, Chairman

Archie E. Patterson, Vice Chairman

J. Whitney Floyd, Secretary

Evening Session

1. "The Place of Forest Fire Control in Forestry School Curriculums." R. Keith Arnold, School of Forestry, University of California, Berkeley, Calif.

Discussion.

2. "They Received Forestry Honors and Awards." J. S. Illick, College of Forestry, State University of New York, Syracuse, N. Y.
3. Symposium: "Master's Degrees in Forestry Schools." Moderator: Kenneth P. Davis, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

"Status, Trends, and Perspective in Master Degree Programs." Myron Krueger, School of Forestry, University of California, Berkeley, Calif.

"Building a Master's Degree Program on a Liberal Arts Foundation." Clarence F. Korstian, School of Forestry, Duke University, Durham, N. C.

"Building a Master's Program on an Undergraduate Degree in Forestry." Ernest O. Wohletz, College of Forestry, University of Idaho, Moscow, Idaho.

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"Employer Viewpoints":

(1) Private Industry. Bernard L. Orell, Weyerhaeuser Sales Company, St. Paul, Minn.

(2) Public. H. Dean Cochran, U. S. Forest Service, Milwaukee, Wis.

General Discussion by Panel.

Open Discussion by members.

Division of Public Relations

Monday, October 25

Ralph G. Unger, Chairman
Albert K. Wiesendanger, Vice Chairman
C. W. Mattison, Secretary

Evening Session

1. "Trees and People." Melvin N. Taylor, Trees for Tomorrow, Inc., Merrill, Wis.

Discussion.

2. "Forestry Extension in Indiana." Edgar J. Lott, Agricultural Extension Service, Lafayette, Ind.

Discussion.

Division of Watershed Management

Monday, October 25

Marvin D. Hoover, Chairman
Robert E. Dils, Vice Chairman
James J. Byrne, Secretary

Evening Session

1. Panel Discussion: "Do Foresters Face Watershed Management Problems in the Lake States?" Moderator: P. A. Herbert, Division of Conservation, Michigan State College, East Lansing, Mich.

Participants: Chester Wilson, Director (retired), Minnesota Department of Conservation, St. Paul, Minn.

R. D. McCulley, Lake States Forest Experiment Station, St. Paul, Minn.

F. G. Kilp, Nekoosa-Edwards Paper Company, Port Edwards, Wis.

K. W. Udd, U. S. Forest Service, Duluth, Minn.

2. Business meeting.

Division of Forest Products

Tuesday, October 26

R. C. Fraunberger, Chairman
Lincoln A. Mueller, Vice Chairman
Russell Stadelman, Secretary

Morning Session

Theme: "Recent Developments in Forest Products in the North Central States."

1. "A New Hardwood Pulpwood Creates Opportunities for Better Forestry in Ohio." W. H. Hildebrand, Mead Paper Corporation, Chillicothe, Ohio.

Discussion.

2. "Problems Resulting from Mechanization in Harvesting Forest Products." Leland J. Hooker, Forest Products Research Laboratory, Michigan College of Mining and Technology, Houghton, Mich.

Discussion.

3. "Trends in Machine Planting." C. A. Samuelson, William Bonifas Lumber Company, Marquette, Mich.

Discussion leader: W. A. Sylvester, Trees for Tomorrow, Merrill, Wis.

4. "Trends in the Veneer and Plywood Industry of the North Central States." H. O. Fleischer and T. R. Truax, both of the Forest Products Laboratory, Madison, Wis.

Discussion leader: Roy Brundage, Dept. of Forestry, Purdue University, Lafayette, Ind.

5. "The Effects of Recent Developments in Furniture Manufacturing on Wood Use." Stephen B. Preston, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

Discussion leader: Fred E. Dickinson, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

Division of Forest Recreation

Tuesday, October 26

Harthon L. Bill, Chairman
William N. Parke, Vice Chairman
Donald Duncan, Secretary

Morning Session

1. "The Contradiction of Wilderness Preservation in a Democracy." James P. Gilligan, Department of Forestry, Oklahoma Agricultural and Mechanical College, Stillwater, Okla.

2. "Management of the Itasca State Park Forest to Meet Recreational Objectives." Henry L. Hansen and Donald P. Duncan, School of Forestry, University of Minnesota, St. Paul, Minn.

3. "Recent Mining Activities in and adjacent to the Roadless Areas of the Superior National Forest." Galen W. Pike, U. S. Forest Service, Duluth, Minn.

4. "Quality Standards for Forest Recreation and Wildlife Production and Harvest." J. V. K. Wagar, Colorado A & M College, Ft. Collins, Colo.

Division of Silviculture

Tuesday, October 26

Philip A. Briegleb, Chairman
J. W. Duffield, Vice Chairman
Henry L. Hansen, Secretary

Morning Session

1. "A Decade of Development in Forest Practices: 1940-1950." Kenneth P. Davis, Department of Forestry, University of Michigan, Ann Arbor, Mich.

2. "Some Results of Revising the Douglas-fir yield Tables to Include Mortality." George R. Staebler, Pa-

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cific Northwest Forest and Range Experiment Station, Olympia, Wash.

3. "Early Growth Response of Central Hardwoods to Management." Leon S. Minckler, Central States Forest Experiment Station, Carbondale, Ill.

4. "Hardwood Tree Grades as a Silvicultural Tool in the Management of Cumberland Plateau Hardwoods." Henry W. Smith, Jr., Department of Forestry and Engineering, The University of the South, Sewanee, Tenn.

5. "Where Does Thinning Fit into the Management of Lake States Pulpwood Stands?" Otis Hall, School of Forestry, University of Minnesota, St. Paul, Minn.

6. Upgrading Slash Pine Seed Sources." Kenneth B. Pomeroy, Southeastern Forest Experiment Station, Lake City, Fla.

Afternoon Session

Symposium: "Coordinating Silvicultural Objectives and Practices with Wood Quality and Species Requirements in the Forest Industries."

Moderator: T. D. Stevens.

1. "Prospective Wood Quality and Species Requirements in the Forest Industries." J. A. Hall, Forest Products Laboratory, Madison, Wis.

2. "The Case for 'Cellulose' Forestry." Russell Watson, Consulting Forester, Manistique, Mich.

3. "Composition and Quality Objectives for the Aspen Type: Aspen Management in the Lake States." Z. A. Zasada, Lake States Forest Experiment Station, Grand Rapids, Minn.

4. "Silvicultural Problems in Central States Forests: Composition and Quality Objectives." L. E. Sawyer, Indiana Coal Association, Terre Haute, Ind.

5. "Successional Trends of Forest Vegetation and Future Wood Supplies." Henry L. Hansen, School of Forestry, University of Minnesota, St. Paul, Minn.

6. Report of Committee on Forest Tree Improvement. Scott S. Pauley, Harvard University, Petersham, Mass.

7. Other committee reports.

Division of Private Forestry

Tuesday, October 26

E. Stanley Hurd, Chairman
Arthur W. Nelson, Vice Chairman
Edwin J. Jankowski, Secretary

Afternoon Session

1. "The Lake States Council of Industrial Foresters. What Is it?" Bruce G. Buell, Northern Paper Mills, Green Bay, Wis.

2. "Industry Forest Management Research in the Lake States." B. L. Berklund, Nekoosa-Edwards Paper Company, Port Edwards, Wis.

3. "Industry Forest Management Research in the United States." W. H. Cummings and F. H. Kaufert, Society of American Foresters Forestry Research Project, St. Paul, Minn.

4. "Forests and the Mining Industry in the Lake States." R. H. Ewalt, The Cleveland-Cliffs Iron Company, Negaunee, Mich.

5. "Railroads and Forestry in the Lake States." W. A. Kluender, Chicago and North Western Railway System, St. Paul, Minn.

6. "Trees for Tomorrow—An Industrial Approach to Resource Management." M. N. Taylor, Trees for Tomorrow, Inc., Merrill, Wis.

Division of Forest-Wildlife Management

Tuesday, October 26

J. V. K. Wagar, Chairman
Ralph T. King, Vice Chairman
Herman F. Olson, Secretary

Afternoon Session

1. "Wildlife Management as a Part of Multiple-Use Forestry—Status and Prospects." Ralph T. King, Department of Forest Zoology, State Uni-

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versity of New York, Syracuse, N. Y.

Discussion leader: Harold G. Wilm, College of Forestry, State University of New York, Syracuse, N. Y.

2. "The Wisconsin Cooperative Forest-Wildlife Program: The Forester's Viewpoint." Dan E. Bulfer, U. S. Forest Service, Rhinelander, Wis.

3. "The Wisconsin Cooperative Forest-Wildlife Program: The Wildlife Manager's Viewpoint." J. R. Smith, Game Management Division, Wisconsin Conservation Department, Madison, Wis.

4. Report of Committee to Integrate Professional Forestry, Range Management, and Wildlife Management Responsibilities. Paul Hickie, Fish and Wildlife Service, U. S. Department of the Interior, Denver, Colo. David F. Costello, U. S. Forest Service, Portland, Ore. Ralph R. Hill, U. S. Forest Service, Denver, Colo.

Joint Meeting

Wednesday, October 27

Division of Forest Economics and Policy

William A. Duerr, Chairman
Henry J. Vaux, Vice Chairman
M. B. Dickerman, Secretary

Division of Education

Kenneth P. Davis, Chairman
Archie E. Patterson, Vice Chairman
J. Whitney Floyd, Secretary

Morning Session

Symposium: "Economics in the General Forestry Curriculum."

1. "The Demand: What Training in Economics and Business Do Employers Want in the General Forestry Graduate?" Lawrence J. Kugelman, International Paper Company, New York, N. Y.

2. "The Supply: What Training in Economics and Business Are the Schools Giving the General Forester?" Albert C. Worrell, School of Forestry, University of Georgia, Athens, Ga.

3. "Some Ideas for Better Meeting the Demand."

"Through General Courses in Economics and Business." Paul G. Keat, College of Forestry, State University of New York, Syracuse, N. Y.

"Through Courses in the Economics of Forestry." Ernest Wohletz, College of Forestry, University of Idaho, Moscow, Idaho.

"Through the Teaching of Economics and Business in Other Courses." Allyn M. Herrick, Department of Forestry, Purdue University, Lafayette, Ind.

4. Comments.

"On the Demand." Russell N. Cunningham, Lake States Forest Experiment Station, St. Paul, Minn.

"On the Supply." Charles H. Stoddard, Independent Timber Farmers of America, Minneapolis, Minn.

"On the Proposals." Otis F. Hall, School of Forestry, University of Minnesota, St. Paul, Minn.

"By Way of Summary." J. Willcox Brown, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

Division of Forest Management

Wednesday, October 27

Merle S. Lowden, Chairman
Myron B. Savage, Vice Chairman
R. Keith Arnold, Secretary

Morning Session

Protection

1. "Fire Control Progress in the Lake States." J. A. Mitchell, Lake States Forest Experiment Station, St. Paul, Minn.

2. Symposium: "Cooperative Approaches to Fire Control." W. S. Swingler, Chairman.

"Fire Compacts and Their Use."

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Arthur S. Hopkins, Northeastern Forest Fire Protection Compact, Chatham, N. Y.

"Cooperative Logging Slash Studies in Idaho." George Fahnestock, Intermountain Forest and Range Experiment Station, Missoula, Mont.

"Cooperative Suppression." R. C. Winkworth, Department of Conservation and Development, Raleigh, N. C.

"Operation Firestop." R. Keith Arnold, School of Forestry, University of California, Berkeley, Calif.

Discussion.

3. "Forest Insect Surveys in the Lake States." Daniel Benjamin, Department of Entomology, University of Wisconsin, Madison, Wis.

4. "Progress in Meeting the Oak Wilt Threat." James E. Kuntz, Department of Plant Pathology, University of Wisconsin, Madison, Wis.

Afternoon Session

Photography and Mensuration

1. "Application of Area Control in Regulation." Perry Fassett, U. S. Forest Service, Cass Lake, Minn.

2. "Continuous Forest Inventory Using Business Machine Methods." John Wright, Union Bag and Paper Company, Savannah, Ga.

Discussion leader: A. E. Wackerman, School of Forestry, Duke University, Durham, N. C.

State Comments. Harold Kollmeyer, Michigan Department of Conservation, Lansing, Mich.

Industry Comments. Frank Frederickson, Minnesota and Ontario Paper Company, International Falls, Minn.

Forest Administration

1. Symposium: "Scientific Management in Forestry."

"Its Place in National Forest Administration." L. K. Mays, U. S. Forest Service, Portland, Ore.

"Its Place in State Forestry Administration." William M. Foss, Division of Lands and Forests, New York Conservation Department, Albany, N. Y.

"Its Place in Industrial Forest Administration." Louis J. Freedman, Penobscot Chemical Fibre Company, Great Works, Maine.

"Its Place in Forestry Education." Walter F. McCulloch, School of Forestry, Oregon State College, Corvallis, Ore.

2. "Where Does Thinning Fit into the Management of Lake States Pulpwood Stands?" Otis Hall, School of Forestry, University of Minnesota, St. Paul, Minn.

3. "Chemical Herbicides as a Tool in Forest Management." John Arend, Lower Peninsula Forest Research Center, East Lansing, Mich.

4. Business meeting.

Division of Range Management

Wednesday, October 27

M. W. Talbot, Chairman
Charles E. Poulton, Vice Chairman
Bert H. Tucker, Secretary

Afternoon Session

Panel Discussion: "Integration of Grazing and Timber Growing."

1. Introductory remarks by Chairman of the Division.

2. "Forest Grazing in the Deep South." Robert S. Campbell, Southern Forest and Range Experiment Station, New Orleans, La.

3. "Effect of Grazing on Timber in the Lake States." Fred B. Trenk, Extension Service, University of Wisconsin, Madison, Wis.

4. "Grazing and Timber Production in the Ozarks." S. Clark Martin, Central States Forest Experiment Station, Columbus, Ohio.

5. "Grazing and Ponderosa Pine Reproduction in the Rocky Mountains and Southwest." Arnold O. Heerwagen, Soil Conservation Service, Denver, Colo.

6. "Harmonizing Forestry and Range Management in the Pacific Northwest." Donald E. Colwell, Cascade Lumber Company, Yakima, Wash.

Society Dinner

Wednesday, October 27

George Banzhaf, Toastmaster

Presentation of the Gifford Pinchot Medal by President E. L. Demmon.

Presentation of the Sir William Schlich Memorial Medal by President Demmon.

Address, "A Broad Look at Our Resource Problem." Reuben G. Gustavson, President and Executive Director, Resources for the Future, Inc., Washington, D. C.

Entertainment.

Ladies' Events

Ladies are cordially invited. There will be a special ladies lounge in the Schroeder Hotel with local hostesses on hand.

A tea has been arranged for Monday afternoon, October 25, to be followed by bridge, and possibly an evening concert.

On Tuesday, an auto tour with luncheon on the lake shore and a drive through Brown Deer Park and Wauwatosa. That evening members and their ladies have been invited to an evening of conviviality as the guests of the Milwaukee breweries.

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On Wednesday morning there will be a tour of one of Milwaukee's art museums, followed by movies and lectures on the nationalities, customs, and costumes of Wisconsin, and on regional art. That evening the annual Society reception and dinner will be held in the Schroeder Hotel.

Hotel Reservations

All scheduled events will be held in the Schroeder, a hotel of 850 rooms. However, the Schroeder will not be able to accommodate all those attending the meeting, hence other hotels are cooperating.

Members should send reservation requests direct to the hotel of their choice. The reservation coupon printed herewith is for their convenience. Those who do not wish to clip the coupon from the JOURNAL may request a reservation by supplying the necessary information.

In any case, be sure to list first, second, and third choice hotels, and identify yourself as attending the meeting of the Society of American Foresters.

There follows a list of cooperating hotels in Milwaukee and their daily rates. They are listed according to size, and their convenience to the Schroeder. All room prices quoted are with bath, unless otherwise noted. Some hotels have rooms with connecting bath at lower rates.

Hotels

Schroeder Hotel, 509 West Wisconsin Avenue, Milwaukee 3. Single, $5 to $10; double, $7 to $10; twin beds, $8.50 to $12. Suites available.

Wisconsin Hotel, 720 North 3rd Street, Milwaukee 3. (Three blocks from Schroeder.) Single, $4.50 to $8; double, $6.50 to $10; twin beds, $9 to $10.

Medford Hotel, 607 North 3rd Street, Milwaukee 3. (Three blocks from Schroeder.) Single, $4 to $5; double, $6 to $7; twin beds, $7.50 to $9.

Plankinton House, 609 North Plankinton Avenue, Milwaukee 3. (Five blocks from the Schroeder.) Single, $5 to $10; double, $7 to $8.50; twin beds, $8 to $12.

Pfister Hotel, 424 East Wisconsin Avenue, Milwaukee 2. (Eight blocks from the Schroeder.) Single, $5 to $9; double, $7 to $10; twin beds, $7.50 to $12.

Tower Hotel, 11th & West Wisconsin Avenue, Milwaukee 3. (Six blocks from the Schroeder.) Single, $4.50 to $5; double, $5.50 to $7; twin beds, $6.50 to $8.

Towne Hotel, 723 North 3rd Street, Milwaukee 3. (Three blocks from the Schroeder.) Single, $4 to $6; double, $5 to $6.50; twin beds, $6.50 to $8.

In addition to the foregoing hotels, there are other good hotels outside the downtown area, and smaller hotels within the downtown area. A complete list of all city hotels and their rates may be obtained from the Convention Bureau, Milwaukee Association of Commerce, 611 North Broadway, Milwaukee 2, Wis.

Motels

Within a radius of fifteen miles from the Schroeder Hotel are at least two dozen motels and tourist courts with rates varying from $5 to $9 for a party of two.

A list of these motels can be obtained from the Association of Commerce, whose address is given above, or from the S.A.F. Committee on Hotel Reservations, the chairman of which is Edward Ritter, U. S. Forest Service, 623 N. 2nd Street, Milwaukee 3, Wis.

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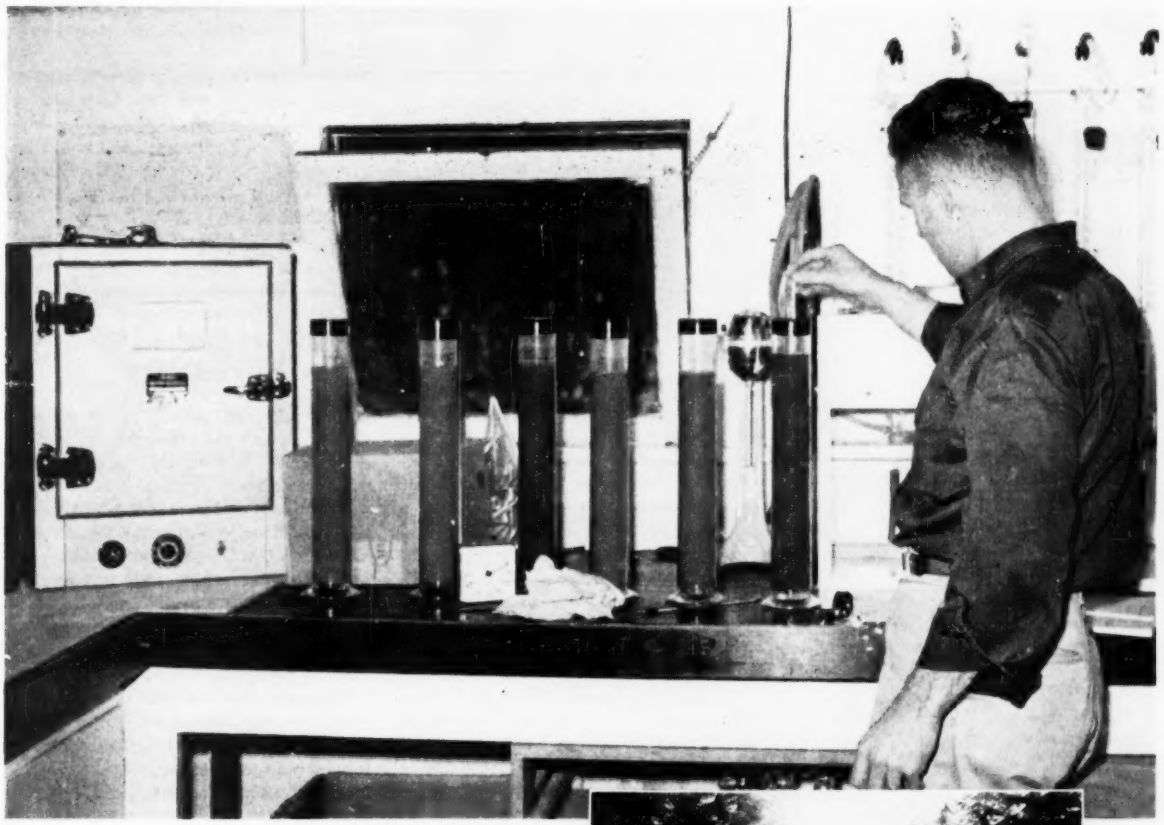

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Meeting Committees

The general chairman for the meeting is H. Dean Cochran, regional forester, U. S. Forest Service, 623 North 2nd Street, Milwaukee 3, Wis.

Assisting him are the following committees and their personnel.

Program Committee

The chairman of the program committee is Kenneth P. Davis, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

The other members are Bruce G. Buell, H. E. Ochsner, Clarence Prout, and L. E. Sawyer.

Arrangements Committee

The chairman of the Committee on Arrangements is Merle S. Lowden, U. S. Forest Service, 623 North 2nd Street, Milwaukee 3, Wis.

Assisting him is H. J. MacAloney and heading up the special task committees are the following:

Publicity: H. K. Pyles.
Reception: Fred G. Wilson.
Entertainment: Stanley Locke.
Hotel Reservations: Edward Ritter.
Meeting Rooms: John Von Bargen.
Field Stops: Allan Haukom.
Ladies Events: Mrs. Ray Bassett.

SOCIETY'S 55TH ANNUAL MEETING
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Student Membership in the Society of American Foresters

Student Membership in the Society of American Foresters is, and deserves to be, a coveted possession of forestry students throughout the country. Many advantages accrue to the student as a result of membership, and all of them contribute to the esteem in which the Society is held in the forestry schools.

Society membership opens the avenue to direct personal contact with leaders in the profession, and with the men who will be the student's associates after graduation. This leads to a feeling of "belonging" on the part of the student, instills in him professional pride and prestige, and provides a background on which he may build a career.

Financially, the student enjoys nominal membership dues of only $3 per year. An annual subscription to the JOURNAL OF FORESTRY alone would exceed this amount by $4.50, and would include none of the privileges of membership. The professional 10 percent discount on all published matter, and provisions for automatic advancement to the junior grade without the payment of the usual $5 admission fee, add up to a sizeable subsidy for the student member.

Students find a wealth of useful information in the JOURNAL OF FORESTRY. Herein the student may gain invaluable perspective, and, at the same time, sharpen his critical abilities. The JOURNAL contains articles about forestry and allied fields written in a

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technically acceptable form. Needless to say, the Student Member's copy of this publication may easily become a well-thumbed reference for styling the overlooked or neglected class report.

While a wide variety of subject matter is contained in every issue of the JOURNAL, the repeated impact of issue after issue, throughout the years, provides an excellent word-picture of the problems, techniques, and developments within the profession. The student may also gain an appreciation of the inter-relationships between the various segments of the profession, and, indeed, may find cause to expand his concept of the "acreage" covered by the term "forestry."

It is often true that the indirect benefits of membership are the most important ones to the student. Society membership makes available the technical background and stimulus which will help the student perform his professional functions in the most enlightened and effective manner possible. A constant exchange of ideas, and the resultant modification of professional practice, is the daily business of the Society. As a result of this, the Society is equipped to provide its members with the best professional advice available.

The "fellowship of kindred minds" found at Society gatherings provides a great deal of satisfaction, and is often extremely productive. Participation in Section meetings and conventions allows the student to get the feel of the profession. He may also witness the oral presentation of subjects which have occupied the best technical minds in forestry, thus supplementing his education, and at the same time requiring an awareness of the problems encountered in forestry.

The junior and senior years in college are ideal years in which to develop an insight into one's profession. They are equally good years in which to build a reservoir of technical information, and to sense the challenge and observe the effect of new ideas.

It is interesting to note that many forestry schools consider Student Membership in the Society as an extra-curricular activity. In this respect membership is very important to the student, since it may be regarded as a reflection of his interest in the profession. Student Membership also affords the student a two-year head-start toward a full and productive professional life.

One of the most important lessons taught to student foresters in the schools today is the importance of

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keeping an open and flexible mind. In a dynamic field such as forestry, it is important to keep abreast of technical developments, especially after graduation. A competent forester's ideas do not remain unchanged over the years. It has been said that, "a good measure of a man's age is the amount of pain he feels when struck by a new idea." This expression could apply equally well in gauging a man's mental agility.

The most basic, and perhaps the most important function of the Society of American Foresters, is the promotion of the profession at every available opportunity. The progress, prestige, and favorable position now enjoyed by the forestry profession are due, to a large extent, to programs of the Society. However, the present position of forestry, and further gains in the future, will not be guaranteed by the momentum of the past, alone. Progress requires the investment of energy and attention by progressive-minded men, whether young or old, who are interested in professional well-being.

Student Membership in the Society of American Foresters is an investment in the future of forestry, and ultimately, an investment in one's own future as a forester. For this reason, if for no other, young foresters need the Society, and the Society needs them.

HAROLD J. ANDERSON

(When this article was written the author was a senior in forestry at North Carolina State College, where he was editor of the 1954 issue of the Pinetum, *the student yearbook of the School of Forestry. He is now working for his M. F. degree at Yale.)*

The Student Member grade was created by amendment of S.A.F. Constitution December 1, 1950: "Article III, Section 3. Student Members shall be junior or senior students, or graduate students not eligible for the Junior Member grade, regularly enrolled in approved curricula at accredited schools of forestry."

The number of student members for each year since the grade was adopted is as follows:

1951	550
1952	550
1953	510
1954	724

An Example of Professional Responsibility

Those members of the Society of American Foresters who attended the Fourth American Forestry Congress at Washington last October, or who have read the Proceedings of this Conference are presented with an unusual opportunity to compare the attitudes and statements of professional foresters, who are guided by the code of ethics of the Society, with the remarks of persons under no such allegiance or restraint.

Canon 3 of the code reads:

3. He will strive for correct and increasing knowledge of forestry and the dissemination of this knowledge, and will discourage and condemn the spreading of untrue, unfair, and exaggerated statements concerning forestry.

In Canon 5 we find:

5. When serving as an expert

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witness on forestry matters, in a public or private fact finding proceeding, he will base his testimony on adequate knowledge of the subject matter, and render his opinion on his own honest convictions.

This is followed by Canon 6, which says:

6. He will refrain from expressing publicly an opinion on a technical subject unless he is informed as to the facts relating thereto, and will not distort or withhold data of a substantial or other nature for the purpose of substantiating a point of view.

Then comes Canon 13, in which we read:

13. He will at all times strive to protect the forestry profession collectively and individually from misrepresentation and misunderstanding.

This Conference was a popular, not a professional, gathering and as such the list of speakers rightfully included many persons who were not professional foresters, nor under any such obligation to observe these principles of conduct if they chose to adopt a different attitude and course. They should have been heard, and they were heard. As the result, many statements appear in these proceedings which are contrary to established facts in silviculture practice, and, in the economic or management field, are based on assumptions which do not square with known situations and policies. There is plenty of scope for enthusiasm and vigorous advocacy on both sides of any public policy, such as regulation of private owners, extension or limitation of federal land acquisition, and even in the technical art of forestry practice when experience has not as yet clearly indicated the best methods of managing forest types. In the latter case, the professional forester will give weight to all the evidence, and scrupulously avoid doctrinaire or theoretical contentions until professional experience has given the idea sound support, based on natural laws. In the field of economics and management, precision, based on experimental research, is less capable of proof. The responsibility here, however, is not less urgent, to state facts correctly. The facts may lead to different conclusions, which is where over-all policies and approaches come in. But to distort, conceal, or ignore factual evidence, whenever it does not fit a theory, or to make charges which the conditions and evidence do not support, is the privilege, not of professional men, but of those who have an axe to grind. Many such charges were made and appear in the proceedings. They were refuted by technical and business representatives in no uncertain terms.

It is not the purpose of this article to call to account any individuals who were responsible for these misrepresentations, nor the organizations whose representatives they were. That may be their way of trying to accomplish "reforms" to which they have been committed by bad advice from some who should have known better. My purpose is to emphasize the true meaning of a professional code of ethics as binding on the members of their profession, and to point out what happened when persons not so obligated give free reign to prejudices.

H. H. CHAPMAN

Change in Scientific Name of Douglas-fir Protested

The Puget Sound Section has presented to the Council its sentiment in regard to recent changes in dendrological nomenclature, more specifically that of the changing of *Pseudotsuga taxifolia* to *P. menziesii*.

Last March in regular meeting the Puget Sound Section passed the following resolution:

Whereas the standardized check list of woody plants, published by the U. S. Forest Service last year, included certain inadvisable changes in scientific and common nomenclature, particularly *Pseudotsuga taxifolia* to *P. menziesii*, I move that a committee from Puget Sound Section formulate a statement of protest and recommendation, with co-sponsorship by the Columbia River Section, if possible. After presentation of the statement of protest and recommendation, a decision by ballot of section members be made and forwarded with the proposal to the National Council for action.

The Columbia River Section was informed of our action which subsequently was recognized in a resolution passed at the Section's annual meeting April 10 as follows:

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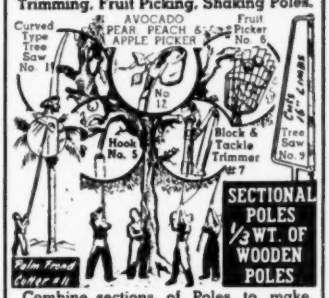
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Whereas the U. S. Forest Service in *Check List of Trees of the United States* dated 1954 has changed the scientific name of Douglas-fir from *Pseudotsuga taxifolia* to *P. menziesii* and

Whereas the justification presented for changing the name is considered inadequate and presumptious because it is based on an obscure and unindexed publication that had gone unnoticed for over 120 years, and further because the specimen collected by Menzies has never been identified as Douglas-fir nor has it been proved that Menzies collected Douglas-fir and

Whereas no one in the Douglas-fir region was consulted or informed when the name change was made and no one in the region has yet been found who does not oppose the change and

Whereas the name *Pseudotsuga taxifolia* is the published name for Douglas-fir in *Standardized Plant Names*, and in *Websters Dictionary*, and in *Encyclopedia Britannica*, and the State of Oregon by legislative action has made *P. taxifolia* the registered State Tree of Oregon and

Whereas the obscure publication upon which the change is based, if eventually judged adequate, is still not justification for the change of a name that has been well established and in world-wide use for over 120 years, when the change is universally opposed by the people living in the natural range of the tree. Precedent for this demand is set by the *Check List* itself in the case of *Sequoia gigantea*, the name of which was retained at the request of local people because of established use even though there was published precedent for another name.

Therefore the Columbia River Section of Society of American Foresters by ballot vote resolves:

1. That the scientific name *Pseudotsuga taxifolia* for Douglas-fir should be retained.

2. That we join the Puget Sound Section and all other interested groups in protesting the adoption of *P. menziesii* as the scientific name for Douglas-fir.

3. That these protests and suggestions by the Section be transmitted to our national headquarters, to the U. S. Forest Service Tree Names Committee, and other interested bodies.

4. That the Society's National Tree Name Committee should have Northwestern representation, and should, also, be represented on the National Committee which adopts standardized plant names.

Following information on this action, a committee was appointed in the Puget Sound Section to study the resolution and made recomendations. Frank C. Brockman, College of Forestry, University of Washington, was appointed chairman. Professor John W. Duffield, also of the College of Forestry, University of Washington, and Philip G. Haddock, Faculty of Forestry, University of British Columbia, were committee members.

Mr. Brockman's committee reported as follows:

It is our recommendation that the Puget Sound Section of the S.A.F. go on record as endorsing the resolution presented at the Columbia River Section's meeting.

Prof. Duffield added the thought that we might place the following as an additional point in the "resolves"—

"That recognition should be given to the principle that the plant names as a means of communication depends on usage, not on arbitrary legislation, a provision widely recognized in the compilation and revision of dictionaries."

Membership of the Puget Sound Section unanimously support the committee's report, the Columbia River Section's resolution, and the inclusion of John Duffield's added thought.

At a meeting of the executive committee, Puget Sound Section, June 7 and prior to the receipt of Mr. Brockman's report, the committee took the following action:

The Executive Committee endorses the resolution of the Columbia River Section presented April 10, 1954 protesting the name change of Douglas-fir from *Pseudotsuga taxifolia*. The executive committee considers the resolution a completely fair, temperate, and restrained expression of facts and endorses the resolution completely.

On July 23, an executive committee meeting was called by the writer wherein both the outgoing and incoming officers of the Section took part. Action was taken and I was requested to present our case to the Council.

We hope that our case is clearly stated and fairly presented. We also hope that the Council will give it full consideration and see fit to support our position and take appropriate action toward attainment of the points presented in the resolution.

Chairman of the Puget Sound Section for the current year is Donald R. Hopkins, State Division of Forestry, 406 Transportation Building, Olympia, Wash. Future correspondence should be directed to Mr. Hopkins.

E. LONERS, *Past Chairman*,
Puget Sound Section

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Kentucky-Tennessee Section Holds Annual Meeting

The Kentucky-Tennessee Section of the Society of American Foresters held its annual summer meeting on May 21 and 22 at Berea, Kentucky. The meeting, with 62 foresters attending, was the largest summer meeting in the section's history. Hosts for the meeting were Berea College and its forester, Sherman Whipple.

The main attraction for the foresters was a tour of the 5,600 acres of college forest land which has been placed under intensive management. One area visited had been cut-over and the products channeled into six different markets including saw logs, stave bolts, pulpwood, mine props, barn poles, and tobacco sticks. The motto for the College is that each tree be cut into the product for which it is best suited by quality and specie. Despite the heavy cut on this area, an adequate growing stock had been maintained for future harvests.

The winter meeting will be held in Nashville, Tenn., in September or October.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatement received in the Society office during the month of August are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of November 1, 1954. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Appalachian Section

Junior Grade

McVicker, G. W., Area Mgr., Gair Woodlands Corp., Garnett, S. C.; W. Va. Univ., B.S.F., 1950.

Smith, G. W. Asst. Extension Forester, N. C. Extension Service, Raleigh, N. C.; N. C. State, B.S.F., 1948. Reinstatement.

Zimmerman, J. D., 1510 Woodland Drive, Durham, N. C.; Duke, B.S.F., 1954. (Student, 1953).

Central States Section

Member Grade

Callahan, J. C., Dept. of Forestry, Purdue Univ., W. Lafayette, Ind. (Junior, 1947).

Reeder, E. A., 616 Commanche Rd., Chillicothe, Ohio. (Junior, 1947).

Columbia River Section

Junior Grade

Judd, H. H., Forester, Bur. of Land Mgmt., Medford, Ore.; Univ. of Idaho, B.S.F., 1951.

Kulosa, E., Transitman, Weyerhaeuser Tbr. Co., Klamath Fall, Ore.; Mich. State, B.S.F., 1950.

Gulf States Section

Junior Grade

Cooper, W. B., Dist. Forester, Deltic Farm & Tbr. Co., Inc., Tallulah, La.; L.P.I., B.S., (Forestry), 1951. (Affiliate, 1952).

Janssen, H. F., Project Forester, U.S.F.S., Charleston, Miss.; State Univ. of N. Y., B.S.F., 1950.

Thigpen, D., Forester, Gaylord Container Corp., Franklinton, La.; L.S.U., B.S.F., 1949; M.F., 1950. Reinstatement.

Intermountain Section

Junior Grade

Taylor, R. E., Forester, U.S.F.S., Farmington, Utah; Univ. of Idaho, B.S.F., 1950.

Southeastern Section

Junior Grade

McMichen, R. D., Forester, Union Bag & Paper Corp., Savannah, Ga.; Univ. of Fla., B.S.F., 1953.

Patterson, L. R., Pineville, Ky.; Univ. of Ga., B.S.F., 1954. (Student, 1954).

Affiliate Grade

Davis, L. L., Supv. Forestry Aide, U.S.F.S., Daholnega, Ga.

Townsend, J. L., Forester Ranger, Ga. Forestry Comm., Baxley, Ga.

Upper Mississippi Valley Section

Student Grade

UNIVERSITY OF MINNESOTA

Carson, R. E.

Associate Grade

Secor, A. J., Farm Manager, 113 First St., Keosauqua, Iowa; Iowa State, B.S., (Agric.), 1905; M.S.A., (Forestry), 1930.

Wisconsin-Michigan Section

Mayrand, E. J., Rt. 1, Corunna, Mich. State, B.S.F., 1950. Reinstatement.

Member Grade

Amsterburg, R. J., R.F.D. 3, Ludington, Mich. (Junior, 1947).

Horvath, V. G., Alpena State Forest, Alpena, Mich. (Junior, 1947).

Stump, W. G., 121 E. Brookfield Drive, E. Lansing, Mich. (Junior, 1943).

Thaler, V. H., R. R. 2, Gaylord, Mich. (Junior, 1946).

Corresponding Grade

Zahiruddin, A. M., Chief Forester, Karnaphuli Paper Mills, Ltd., Chandraghona, East Pakistan.

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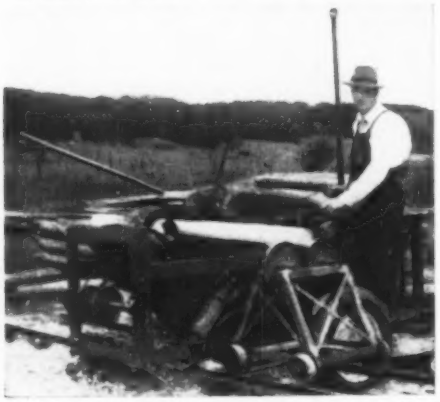

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Forestry News

A STEARMAN PLANE lays a path of insecticide over ponderosa pine trees infested with pine butterfly on the Boise National Forest, Idaho. The pilot is in the process of distributing the spray up and down the canyon at a level of 100 to 250 feet above treetop height. The spray belt is about 400 feet wide. Note that plane's path approximates contour of the drainage on the opposite side of the canyon. *Lower right:* Larvae of pine butterfly (*Meophasia menapia* [F. and F.]) feeding on pine needles during first and second instars. *U. S. Forest Service Photos*

Indian Forester's 80th Year

The Indian Forester, published by the Forest Research Institute and Colleges at Dehra Dun, India, is now in its 80th year of existence.

The oldest English-language forestry journal in the world, it was founded in 1875 by Sir William Schlich and his colleague Baden Powell. In his statement of policy Sir William made the following declaration, as pertinent today for scientific publications everywhere, as it was eight decades ago in India:

"As to our principles, they are decidedly liberal and independent. We, and all who communicate with us, are free to express what we think; we shall not repress any criticism on what we honestly believe to be wrong, or say anything that we do not believe to be true to please *any one.* We shall endeavour to extenuate nothing and we shall 'set down nought in malice.'

"But free, full and unfettered discussion of every principle and practice is the very life of forest science and art.

"That discussion it will be an endeavour to facilitate with all the means at our disposal. But this thing we will do—we will impress on ourselves and our contributors the absolute maintenance of courtesy and good temper in the thick of the hottest discussion, and we will banish from our pages everything that verges on personality or harshness of expression. Our criticism will be directed to measures, not men, to the opinion and utterances of the impersonal office, not to the thoughts and deeds of individuals."

Hogs and Taxes Receive Attention in Louisiana

Two forestry bills, labeled the most important forestry legislation in Louisiana since 1910, were passed by the state legislature in June, according to R. H. Crosby, Jr., president of the Louisiana Forestry Association. Both bills were sponsored by the Association.

One bill outlaws the roaming of hogs in the piney woods while the other sets up an entirely new method of forestry taxation. The hog bill pro-

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vides for the impoundment of woods hogs found in the pine lands and a fine for the hog owner.

"The woods hog," Crosby said, "has caused many landowners to postpone big reforestation projects."

The forestry taxation bill, drawn up as a Constitutional amendment to be voted on by the people this fall, provides that trees not be taxed until cut. It sets up four classifications of timber lands for assessment purposes: Cypress, hardwood, longleaf pine, and other pine. Assessments in the future may vary between parishes of the state but cannot vary within a parish.

Besides these provisions, the bill set up a different method of distributing the timber severance taxes. Instead of all severance taxes going to the state forestry agency, which is now done, the individual parishes would receive 75 percent of the revenue and the state would receive 25 percent.

"The amount which the Louisiana Forestry Commission looses from this bill will be replaced by state appropriation," Crosby stated, "and this will benefit the state agency in that it will know exactly how much it is to receive each biennium."

Industrial & Private

Industry Plants and Distributes 180 Million Trees

The southern pulp and paper industry was responsible for the planting of 180,250,000 trees during this past planting season. The survey was conducted by H. J. Malsberger, forester and general manager of the Southern Pulpwood Conservation Association of Atlanta, Ga., and 46 pulpmills and 30 pulpwood dealers provided the information. The area covered includes the eleven southern states extending from Virginia to Texas.

The industry planted 138,250,000 trees on its own lands and also increased by 58 percent the number donated to small landowners, which this year totaled 42 million trees. Last year's combined total, planted and distributed, was 128,000,000 trees.

The nurseries operated by the state foresters and other public agencies sold 147,837,500 seedlings to the industry and the remaining 32,412,500 were produced in nurseries operated by nine pulp and paper companies.

Pulp Companies Employ 1,516 Foresters

Pulp companies in the United States now employ 1,516 graduate foresters, an average of nine for each of the 171 firms using pulpwood, according to a study made by the American Pulpwood Association, 220 East 42nd Street, New York City.

More than half this number are engaged in forest management. This group of *868* professional foresters compares with *263* so engaged just seven years before. "This comparison shows that pulp companies' employment of professional foresters for management of woodland increased 300 percent between 1945 and 1952," W. S. Bromley, Executive Secretary of APA, pointed out.

"Actually, pulp companies have more than 1,516 graduate foresters on their *1954* payrolls. The postwar pace in hiring such men continued beyond the base year of our study, of course," Bromley explained. The 1,516 are part of the 6,200 privately employed foresters in the country as estimated in November, 1953, by the Society of

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We like to think, and believe, that America's foresters and their professional society have contributed substantially to the tremendous progress made since the turn of the century.

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Next to forest management, timber procurement is the professional duty most frequently given by the pulp companies as occupying numbers of their foresters. The survey found 256 in timber procurement in 1952, 134 in logging, 54 in research and 204 in various other categories of forestry work.

Pulp companies of the South are far in the lead in employing graduate foresters, having 825 of the 1,516 in all pulp industry in 1952 as inventoried by APA. The numbers in other regions are: West, 332; Northeast, 193; Lake States, 140; and Appalachian, 26.

The Southern firms put the professional foresters into forest management posts in proportions exceeding those of other parts of the country. The number so assigned rose from 117 to 524 in the South in the seven years. Elsewhere, the gains were: Appalachian, from 5 to 18; Northeast, from 40 to 114; Lake States, from 29 to 67; and West, from 72 to 145.

"The increase in non-technical personnel in forest management further shows the employment effects of the pulp industry's stepped-up conservation work," Mr. Bromley said. "Such workers increased from 2,003 in 1945 to 3,224 in 1952." In the South they increased five times over, from 321 to 1,755; in the West, from 68 to 248; Lake States, from 21 to 54; and Appalachian region, from one person to seven. There was a decline in the Northeast, from 1,592 to 1,160, but the 1952 total here was nevertheless the second largest corps of non-technical employees in forest management in the United States pulp industry.

The study of forestry personnel was one of five in APA's overall forest management inventory of 171 companies having 252 wood pulp mills among them.

R. N. Hoskins Honored

Robert N. Hoskins, industrial forester for the Seaboard Air Line Railroad, was recently honored by receiving the "Chicago Merit Award." This award is given by the Chicago chapter of the Iowa State College Alumni Association for "advancing human welfare." It cited Hoskin's energy and efficiency in forestry work and in "the training of youth in efficient methods and forthright citizenship."

A similar award was made at the same time to Theodore V. Houser, chairman of the board of Sears Roebuck, for work with the YMCA.

South's Pulpwood Cut Continues to Increase

A total of 16,127,000 cords of pulpwood, 61 percent of total receipts of domestic pulpwood by all U. S. pulp mills, was produced in the 12 southern states in 1953.

A report prepared by J. W. Cruikshank of the Southeastern Forest Experiment Station, in cooperation with the Southern Forest Experiment Station and the Southern Pulpwood Conservation Association shows that all southern states except Tennessee showed increased output in 1953 over 1952. Georgia was the South's leading producer with 2.9 million cords. Mississippi ranked second with 1.9 million; and Florida with 1.7 million. Except for Arkansas, Tennessee, and Oklahoma, all southern states produced more than a million cords each. Of the 1953 total, 76,000 cords were produced from wood residues; veneer cores, cull crossties, ends of poles and piling, and sawmill slabs and edgings.

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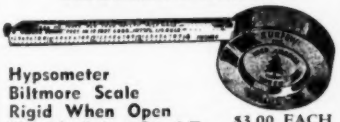
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J. L. Stearns Named Sales Manager of Insular Lumber Sales Corporation

Joseph L. Stearns, lumber technologist, has been named sales manager of Insular Lumber Sales Corporation, Philadelphia, Pa.

"The owner of one of the world's largest private collections of wood species—more than 3200 varieties—Stearns has had more than 25 years experience in the lumber and wood industries," J. Raymond Peck, chairman of the board of Insular, said in announcing the appointment.

Prior to joining Insular, producers of Philippine mahogany, Stearns was assistant director of research for Timber Engineering Company, research affiliate of the National Lumber Manufacturers Association.

Stearns is a graduate of Pennsylvania State University's forestry school where he majored in wood technology. He later studied engineering at George Washington University.

Latin American Meeting on Pulp and Paper Industry

The development problems of the Latin American pulp and paper industry will be studied and discussed by experts from various parts of the world, who will meet in Buenos Aires from October 18 to November 2. This meeting is being sponsored by the Economic Commission for Latin America, the Food and Agriculture Organization and the Technical Assistance Administration of the United Nations, as well as by the Argentine Government.

The principal pulp and paper experts and representatives of specialized institutions in Australia, Canada, France, Germany, Great Britain, Sweden, and the United States will be present or will send documents of a technical nature, which, together with those of the United Nations organization and Latin American experts, will serve as a basis for an interchange of knowledge and experience and discussion of the problems hindering the development of the Latin American pulp and paper industry. The products of this industry are considered of vital importance for the economy and culture of the region.

Although during the last 15 years the domestic output of paper in Latin America has been doubled, the region imports more than two-fifths of the paper and cardboard it consumes, and almost half the pulp required by the paper industry.

S. L. Frost on Ohio Watershed Assignment

The Ohio Forestry Association, Inc., has retained the service of S. L. Frost, Washington, D. C., as coordinator for its Conservation Plan Committee.

This committee was set up last January to develop organized plans for conservation programs sufficiently flexible to meet the needs of Ohio's watersheds, thereby advancing the welfare of all, and to promote general interest in such practical programs throughout the state.

Chairman of the 28-man committee is E. B. McConnell, Cleveland, vice president of The Standard Oil Company (Ohio). Subcommittees have had under consideration the problems of water use in farming, water use in municipalities, water use in industry, education, research, and relevant legal matters.

Mr. Frost will integrate the findings of these task groups, and will blueprint the ways and means of translating them into action in various Ohio watersheds.

From 1948 to 1952, Frost was executive director of the American Forestry Association. Previously he had been for 12 years with the Texas Forest Service. He has recently been serving as a consultant in the field of natural resources and conservation.

J. M. Crowl Joins Reclamation Association

John M. Crowl, formerly range conservationist, Bureau of Land Management, Carson City, Nev., resigned July 1 to accept a position with private industry in Kentucky. He has been employed as executive director of the Kentucky Reclamation Association, an association composed of coal mining companies engaged in the mining of coal by the open pit method. The disturbed land thus created is then reclaimed by planting to trees. He will be located at Earlington, Ky.

S. O. Heiberg Touring Europe

Prof. Svend O. Heiberg, chairman of the Silviculture Department at the State University of New York College of Forestry, Syracuse, left in August for a six-month tour of European forestry institutions.

He will study forestry education in several European nations as part of a survey for the Society of American Foresters. He has also been invited as a consultant on forest experiment stations and forestry schools for the Danish Government. In addition, he will lecture on forestry in Scandinavia and in German forestry schools at Gottingen, Freiberg, and Munich.

Prof. Heiberg began his studies in England. He will tour Scandinavia, the low countries, Germany, France, and Switzerland. A graduate of the Royal Danish College of Agriculture in 1922, he received his degree of master of science in forestry there in 1924 and his master of forestry degree from Yale University in 1927.

Government

Jay P. Kinney Retired

Jay P. Kinney of Washington, D. C. recently retired after 48 years of distinguished service in the federal government.

Born in Otsego, N. Y. in 1875, Mr. Kinney was one of the earliest forestry students in Cornell University. Following his forestry training he obtained a law degree from National University, and was admitted to the bar of the Supreme Court of District of Columbia.

Entering the Patent Office in 1906, he four years later became forester of the newly organized Forestry Branch of the Indian Service. He served continuously in the Department of the Interior until 1945 when, at the request of the Department of Justice, he was transferred to that department as special assistant to the Attorney General to help with the preparation of the defense in the case of a suit against the government by the Menominee Indian Tribe.

He is the author of the books *Essentials of American Timber Law*, *Development of Forest Law in America*, *A Continent Lost—a Civilization Won*, and *Indian Forest and Range*.

A member of the Society of American Foresters since 1912, he was elected a Fellow in 1941. He was the subject of a "We Present" biographical sketch in the JOURNAL OF FORESTRY for December, 1947.

His residence is now Springfield Center, N. Y.

John Wasilik Retired

John Wasilik, Jr., long time ranger of the Wayah District, Nantahala National Forest, Franklin, N. C., has retired after 33 years with the U. S. Forest Service.

Mr. Wasilik entered the Forest Service in 1922 following graduation from Yale University where he received the Ph.B. and M.F. degrees.

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Record National Forest Timber Harvest for Year

Timber harvested from national forests during the year ended June 30, 1954, was an all-time record 5,370,022,000 board feet, according to the U. S. Department of Agriculture. This represents an increase of 4.07 percent over last year's record of 5,160,355,000 board feet.

The greatest increases in timber cut were reported from forests in Montana and Idaho where access roads have been built to salvage insect infested timber. Forest Service Region One, made up of Montana and northern Idaho, increased timber cut from 574,255,000 board feet in the year ending June 30, 1953 to 648,091,000 board feet in the year ending June 30, 1954. The 41,168,000 board foot increase reported from Forest Service Region Four, made up of Utah, Nevada, western Wyoming and southern Idaho, was due primarily to timber salvage work in southern Idaho.

The value of the timber taken from the national forests showed a drop of about $1.50 per thousand board feet, reflecting lower stumpage prices throughout the country. Total value of the timber harvested, therefore, dropped from $70,616,025 in 1953 to $65,407,400 in 1954.

Rowland Named BLM State Supervisor in Arizona

Edgar I. Rowland, who since last spring has been assistant lands officer in the Washington office, Bureau of Land Management, has been appointed Arizona State Supervisor for the agency with headquarters at Phoenix, Arizona.

Rowland was graduated from the School of Forestry, University of California. In 1946, at the end of his military service, he returned to the Bureau of Land Management, where in 1949 he was named regional chief, land planning, in the San Francisco regional office. When BLM was reorganized last spring, he was transferred to Washington as assistant lands officer.

National Forests Bring in $67 Million During Year

Receipts from the sale of timber and leasing of lands on national forests totaled $67,219,619 between July 1, 1953 and June 30, 1954, the U. S. Department of Agriculture has reported. This represents a decrease of $9,244,127 from collections made by the Forest Service during the previous year, ending June 30, 1953.

Of this past year's total receipts, $61,288,630 were from the sale of timber. This compares to $69,252,134 collected from this resource a year ago. An additional $1,513,317, largely derived from the sale of timber, was deposited in special funds pending settlement of the administration of certain lands in Oregon and Alaska.

Permits for the grazing of cattle, sheep, horses and swine brought in $3,107,172 during fiscal year 1954 as compared to $4,415,852 during 1953. Lower beef prices account for this reduction, as grazing fees are based on the market price of meat.

Leasing of lands for summer homes, resorts, mining and power totaled $1,310,500, an increase of $246,018 over such collections during the previous year.

Insect Control on the Boise National Forest

The Forest Service has carried out another attack on forest insects. This time some 255,000 acres of ponderosa pine on the Boise National Forest in Idaho were threatened by the pine butterfly, a defoliating insect. The aerial spraying project to control this defoliater was the first to be undertaken in the United States. Two previous infestations have been recorded, one on the Yakima Indian Reservation in 1893 to 1895 and one on the Payette National Forest in 1922 to 1923.

Drastic steps had to be taken to protect timber, watershed, and recreational values and prevent loss of revenue to industry by reduction in the yearly cut of timber. Aerial spraying of DDT (from about June 10 to July 10) was the only feasible approach to satisfactory control. In advance of the actual fieldwork, the Forest Service had to assure purchase and delivery of the insecticide, contract with plane owners for flying and above all, to plan ahead for a safe job. The total cost of the project amounted to about $0.88 per acre.

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Entomologists checked results of the spraying on the butterfly larvae. Card check lines on the spray units permitted accurate evaluation of the distribution of spray. Thus any area not receiving an adequate dosage to kill the larvae could be located. Very little spraying was necessary.

Project Entomologist Leslie Orr reported larvae mortality on the project at 99 plus, an exceptionally high degree of control.

Color Air Photos Used in Research on Beetle Damage

Forest research workers in Oregon are using colored aerial photos to gain new information on the current Douglas-fir bark beetle epidemic in western Oregon and southwestern Washington.

On colored photographs of sample areas, interpreters count the trees killed by the beetle. Beetle-killed trees stand out against the healthy green trees on the photos. Dead trees are straw-yellow to reddish-brown in the early stages. Later they turn purplish and finally gray.

The present aerial photo study is a cooperative project of the U. S. Forest Service, Pacific Northwest Forest and Range Experiment Station, and the Oregon State College Forest Experiment Station. John F. Wear of the Forest Service, a national pioneer in the use of colored aerial photos for forest insect and disease detection, took the photos. J. R. Dilworth, OSC forester, is making the interpretations. Robert B. Pope of the Forest Service is project coordinator.

The trees now being counted were killed by beetles that bred in trees uprooted by the wind in the winters of 1949 and 1950. The beetle multiplied in the down trees and then spread to green trees. So far, about two billion board feet of timber have been killed by the beetle and about ten billion by windfall in the western Oregon-southwestern Washington region.

Surveys of blowdown and beetle damage have been made during the past two years by sketch mapping from low-flying aircraft. These surveys have provided landowners with data on the location and extent of the damage to guide them in salvaging the dead timber, the only feasible method of control.

Foresters are following the progress of the beetle epidemic as an aid in developing control measures. In looking for shortcuts, they have turned to colored aerial photos as a substitute

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for the costly aerial sketch mapping. They hope to follow the course of the epidemic by taking colored aerial photos of sample areas in successive years.

C. C. Strong to Afghanistan FOA Assignment

Clarence C. Strong, assistant regional forester in charge of State and Private Forestry, U. S. Forest Service, Missoula, Mont., has accepted a two-year assignment with the Foreign Operations Administration program in Afghanistan. He will be the forestry member of a Point IV team to be headquartered in Kabul.

Strong has more than thirty years' federal service in the Northern Region of the Forest Service. Since 1946 he has been responsible for cooperative forestry programs, cooperative forest fire prevention programs, and relations with state forestry departments, as assistant regional forester.

Education

New York Totals $23,000 Industrial Grants for Coming Year

Graduate fellowships and grants totaling $23,000 have been awarded by industrial concerns to the State University of New York College of Forestry for the coming college year, it has been announced by Dr. Edwin C. Jahn, Associate Dean for Forest Research.

Five of these awards, totaling $11,000, are new. The remainder are continuing.

They deal primarily with wood technology and pulp and paper research. Industrial firms represented include the American Viscose Corporation, the Edwin L. Wiegand Company of Pittsburgh, the National Starch Products Company, Durez Plastics and Chemical Company, the M. W. Kellogg Company, the Dixie Cup Company, the American Smelting and Refining Company, the Polaroid Corporation, and the Monsanto Chemical Company Plastics Division.

Wohlenberg to Teach Industrial Forestry at Yale

Ernest T. F. Wohlenberg, of Ukiah, Calif., has been appointed to the newly created post of Professor of Industrial Forestry at the Yale University School of Forestry, and will head a new graduate program of teaching and research on the problems of private forestry enterprises. The new professorship, according to Yale, is the first of its kind in American forestry education.

The post has been established by the financial support of the Edward Hines Lumber Company, through the Ehlco Foundation of Chicago, Ill., and of the Michigan-California Lumber Company of Portland, Ore.

Professor Wohlenberg retired in September as vice president of the Masonite Corporation and general manager of its California operation upon reaching the company's mandatory retirement age. He assumed his new duties at the beginning of the fall semester.

The new Yale program will be a major expansion of the current industrial forestry courses at the School of Forestry, and will provide instruction for graduate students in the school and short-term seminars for industry representatives. The graduate instruction will take up the economic aspects of forest products industries, including business organization and operation.

Wohlenberg received his Bachelor of Science degree in 1912 and his Master of Forestry degree in 1913, both from the University of Nebraska. He has had wide experience in both government and industrial forestry and has taken an active part in forestry and conservation activities in the West.

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having served most recently as president of the Redwood Region Conservation Council in 1951 and 1952 and as president of the Western Forestry and Conservation Association in 1953.

Gair Woodlands Corporation Awards Scholarships

Scholarship awards were announced recently by Mr. T. W. Earle, president of Gair Woodlands Corporation, Savannah, Ga., of $2,000 each for four years of study at the Universities of Florida and Georgia.

Charles W. Godfrey, graduate of Callahan High School in Nassau County, Fla., received the scholarship award to attend the University of Florida.

Stanford L. Tillman, a graduate of Surrency High School in Appling County, Ga., was the recipient of the award to attend the University of Georgia.

Students interested in the study of forestry, and graduating from high school this year in the areas in which Gair Woodlands Corporation operates, were permitted to apply for the scholarship. Preliminary screenings were held early in June by the Corporation in southeastern Georgia, southern South Carolina, and northeastern Florida. The students were judged on scholarship achievement records, extra-curricular activities in the field of forestry, personality traits, and leadership ability.

"The scholarships are awarded to create a greater interest in the study of forestry," stated Mr. Earle upon making the awards.

From the preliminary screenings eight top students were selected to appear before a board of four judges for a final screening. Members of the Awards Committee were: S. A. Boutwell, chief forester, Gair Woodlands Corporation, Savannah, Ga., and H. J. Malsberger, forester and general manager, Southern Pulpwood Conservation Association, Atlanta, Ga., who judged both awards. Also, judging for the University of Georgia scholarship were D. J. Weddell, dean, School of Forestry, University of Georgia, Athens, and Guyton DeLoach, director, Georgia Forestry Commission, Atlanta; and the judges for the University of Florida Award were C. M. Kaufman, dean, Forestry School, University of Florida, Gainesville, and C. H. Coulter, state forester, Florida Forest Service, Tallahassee.

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Forester wanted, not subject to draft; age 25 to 30; South Arkansas, private industry. At least two years experience required in cruising and marking timber.

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Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

NOTICE TO INDUSTRY
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Keith Cranston, *Forestry Consultant*
LELAND, MISSISSIPPI

Positions Wanted

Forester, 27, B.S. Purdue 1951. Married, two children. Recently released officer U.S.M.C., with draft exempt status. Experience: Forestry Officer at large eastern camp, including pulp and saw timber logging, sawmill operation, timber cruising, and road building and maintenance. Desire permanent position in northern locality.
Box L, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F. Pa. State, desires position with forestry consulting firm or as farm forester. Preference East. Bookkeeping, accounting, personnel, and business experience. Married, age 24, one pre-school child, recently released Air Force officer.
Box M, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S. 1947, M.F. 1951, Univ. of Minn., age 33, married, two children. Veteran, honorably discharged from Navy. Experience: total 8 years, government and private; 6½ years present position as forester private industry, all phases of forest management. Desire additional experience. Prefer to locate West, private industry.
Box N, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester-naturalist seeking to apply abilities in public contact, information, writing, photography, and lecturing with enterprise or institution related to outdoors, nature, or conservation. B.S., M.F. Recreational Forestry. Age 33, married. One year county forester, 5 years National Park ranger. Would consider any opportunity related to nature education, recreation. Prefer to locate in North Central States.
Box O, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, 26 B.S.F. 1951 desires a change toward greater responsibilities and opportunities. Over three years experience in silviculture and forest management research. Willing to travel. Married, one child, draft free, top recommendations.
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Minnesota and Ontario Paper Company 8th Award Granted

John R. Jones, a 1954 honor graduate of the Michigan State College School of Forestry, has received the 1954-55 Minnesota and Ontario Paper Company Forestry Research Project award, according to Dr. Frank H. Kaufert, director of the University of Minnesota's school of forestry.

Graduate fellowship is in its eighth year and provides funds for concentrated studies of forestry problems meriting special attention. The project is under the supervision of Dr. A. E. Schneider.

This year's fellowship, will be used to determine the amount and kind of damage occurring to young trees during tree harvesting operations. The 1954-55 project will also obtain further information on the growth rates of young spruce and balsam trees after older and taller trees, such as aspen, have been removed. The results of these studies will be made available to the public.

Jones, whose home is at East Lansing, Mich., has had forestry experience in Michigan, Minnesota, and Montana and is a veteran of World War II.

John Zivnuska to Lecture on Forestry in Norway

John A. Zivnuska, assistant professor of forestry at the University of California, has received a grant under the Fulbright Act to lecture on forestry in Norway. He will serve with the faculty in forestry at the Norges Landbrukshogskole in Vollebekk, where he will lecture in the fields of forest economics and forest practices of the western United States during the coming academic year. He will remain in Europe during the summer of 1955 to study forest management practices in the Scandinavian countries.

Zivnuska graduated in forestry at the University of California in 1938 and received the M. S. degree there in 1940. He was awarded the Ph.D. degree at the University of Minnesota in 1947. Prior to joining the forestry staff of the University of California, Zivnuska's experience included teaching at the University of Minnesota and work with the U. S. Forest Service. He recently completed a special assignment on the timber requirements study conducted by Stanford Research Institute for Weyerhaeuser Timber Company.

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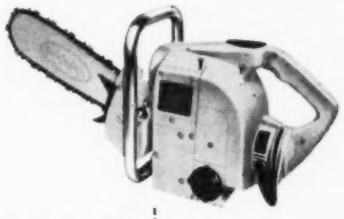

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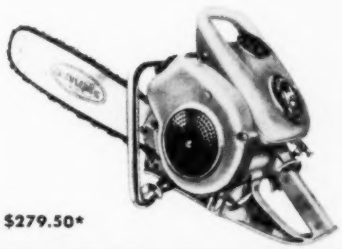

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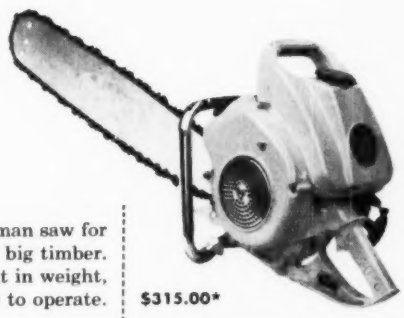

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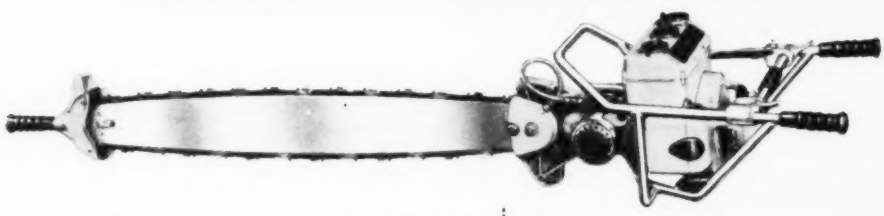

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